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IN ITS 75th YEAR

January 17 1959

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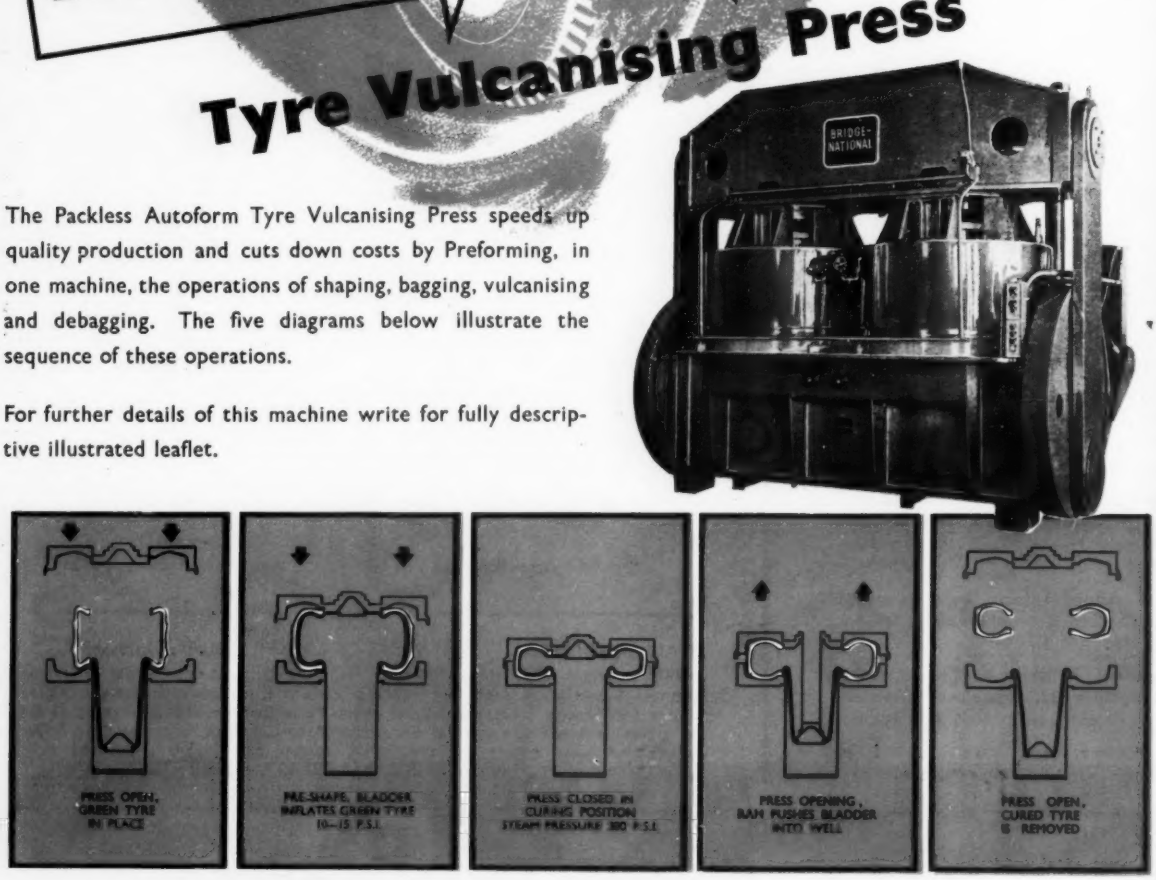

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NOTES of the WEEK

Challenge

FOR some reason a new year, even one that, as in this case, is already nearly three weeks old, is always regarded as a challenge; as a spur to greater achievements; to better and bigger efforts; to the beating of records; to sales graphs that call for more paper in the upper regions. 1959 is no exception. Everything is going up—including, undoubtedly, the cost of living but excluding, one somehow feels, the final balloon; that, if the world's ' defence ' allocations continue paranoiacally to soar, is perhaps to come in some later ' Bright New Year.' However, to our polymers. This year will see, from all estimates, still further increases in synthetic rubber production capacity. Present extra-US (and excluding Russia) capacity is of the order of 330,000 tons against American production of over 1 m. tons. Predictions are that production capacity outside North America will rise to some 700,000 tons within the next three years. With US and Canadian production, the total annual capacity would then be about 2 m. tons. In something like the same time, natural production, allowing for continued and stepped up replanting and new planting, should rise to approximately the same figure. On the plastics side, the most recently announced new materials, such as polypropylene, the polycarbonates and polyformaldehyde, can be expected to be in the centre of developments which cannot fail to be interesting and, perhaps, exciting. Then, too, the production capacities in the UK, for PVC, polythene and polystyrene are all on the increase; that of the first may reach towards 90,000 tons; the second, in spite of not being a synthetic organic chemical, should not be very far short of 80,000 tons, while the third, it is estimated, should climb towards the 50,000 ton level. All in all, and leaping from beginning to end, next year's review should show that 1959 has been a good year.

Small But Not Trivial

THE imperial standard yard is shortening at the rate of over one millionth of an inch a year. Also, there is evidence that the imperial standard pound (lb.) is diminishing by about 7 parts in 10 million since 1846. These amounts may seem trivial but, in the case of the yard, which is about 5 parts per million less than the US yard (which is defined in terms of the metre), the discrepancies in measurements of length are of increasing importance in modern precision engineering. For example, it is necessary to know the lengths of the highest grade block gauges accurately to one part per million, and the permissible error on accurate yard scales is 0.0001 in. The imperial standard pound is about 2 parts in 10 million smaller than the US and Canadian pounds which are defined in terms of the closely safeguarded international prototype kilogramme. To secure identical values for each of these units in precise measurements for science and technology it has been agreed to adopt an international yard and an international pound having the following respective definitions: 0.9144 metre and 0.453 592 37 kilogramme. This move follows the discussions, announced by the DSIR on January 1, which have been held between standards laboratories in Canada, New Zealand, UK, South Africa, Australia and the US. It has also been agreed that unless otherwise required all non-metric calibrations carried out by these standards laboratories on or after July 1 1959 will be in terms of these international units. The adoption of the international values of the yard and the pound is undoubtedly a move that could not have been much longer delayed and it will be of particular benefit to all who are concerned with accurate measurements for scientific and technological purposes in the Commonwealth and the US.

Factory Law

IN the text of the new Factories Bill, available at the end of last year, the citation describes it as a measure to amend the Factories Acts 1937 and 1948 and to make further provisions concerning the health, safety and welfare of workers. It is provided that the new measure shall come into force on a day or days to be appointed by the Minister of Labour. Except for one Clause—which deals with the importation of dangerous materials—it does not apply to Northern Ireland. There are new safeguards against outbreak of fire, and the scope of previous legislation is widened to ensure effective means of escape and the adoption of efficient fire alarms. Appropriate fire-fighting equipment must be provided and there must be effective cooperation between the factory inspectorate and the fire-prevention service. Changes in the penalty provisions of the 1937 Act include: (*a*) The maximum fines for various specified breaches of the law are doubled. (*b*) The additional fines which can be imposed where contravention results in injury or death is abolished. Instead, the courts may impose a higher maximum fine for a breach likely to lead to such a result. (*c*) The provision that part of a fine imposed for a breach in which a person is killed or injured can at the Minister's discretion be awarded to that person or to his dependents is abolished. Among other changes, Defence Regulation 59 is revoked, being replaced by a clause which limits the power to grant exemptions from the law regulating the hours of women and young persons.

NEWS *Briefs*

POLYTHENE PRICE DROP—INDONESIAN ESTATE PRODUCTION — MALAYAN RUBBER FOR RUSSIA ISRAEL-GHANA TRADE—NIGERIAN PLANTATION

●**Indonesia** — Production of estate rubber in Indonesia declined by 6.1% during 1958, according to Antara News Agency, which said that figures on the decline came from a memorandum prepared by Agriculture Minister Sadjarwo. The rubber production figures, according to the memorandum, for 1958, amounted to 242,797 tons, compared with 258,576 in 1957.

●**United States** — The Commerce Department on January 9 clamped restrictions on the export of 85 commodities to Poland and removed 30 items from special licensing requirements. The action follows a November 10 revision of United States export controls. Added to the list of commodities requiring individual export licences for shipment to Poland effective on January 15 were certain commodities and related items in the following categories: rubber and manufactures, such as butyl, polyurethane, and truck and industrial tyres, and certain chemicals, such as polythene.

●**Malaya**—Russia is expected to lift about 18,000 tons of rubber from Singapore and Port Swettenham within the next month or so, according to a local Press report. The 'Malay Mail' says rubber trade experts in Kuala Lumpur predict heavy buying from the Sino-Soviet bloc during the next few months.

●**Russia**—A Ukranian plant is preparing to start production of midget cars, Soviet news agency Tass reports. Two-doored four-seaters would have a five horsepower air-cooled engine and a speed of up to 50 miles an hour, and the first batch would be ready next year, Tass said.

●**France** — Shipping freight rates between Vietnam and Europe have been increased by 17.55% by the Indo-Chinese Shipping Conference following the devaluation of the French franc. The decision is retrospective from December 29.

●**United Kingdom**—The number of motor vehicles counted on Trunk and Class I roads in England and Wales during the traffic census in the week ended August 17 1958 was 14% greater than in the corresponding week in 1957, according to the Ministry of Transport and Civil Aviation. During the week of the manual census the Ministry's Road Research Laboratory estimated that 1,250 million vehicle miles were travelled on the classified road network of Great Britain of which 950 million vehicle miles were travelled on Trunk and Class I roads.

●**United States**—The price of Marlex rigid high-density polythene will be reduced to 38 cents per lb. from 43 cents, it was announced on January 9 by Phillips Chemical Company, a subsidiary of Phillips Petroleum Company. Several other producers, including Union Carbide Plastics Company and W. R. Grace and Co., said they would stay competitive with Phillips.

●**Israel** — Under a new trade agreement between Israel and Ghana, Israel is to export items among which are trichlorethylene, glass fibre for insulation purposes, and selections of plastics and rubber manufactures. In return, Ghana will export a number of commodities which include crude rubber.

●**Malaya** — Malayan rubber planters and their employees may sign a new wage agreement on January 20, according to Mr J. A. T. Perara, secretary of the Malayan Planting Industries Employers' Association. The Association and the National Union of Plantation Workers have been negotiating over a new wage scale for the past ten months. The union wants wages unpegged from rubber prices.

●**Nigeria**—A new rubber plantation estimated to cost £900,000 is to be established in Nigeria. Western Nigerian Premier Obafemi Awolowo announced the project on January 13. The Western Region Production Development Board which is to establish the plantation, already has some 7,500 acres under rubber and operates big rubber estates at Araromi and Urhonighe. The board is in partnership with the Colonial Development Corporation and the West African Joint Agency Ltd. in an 8,600 acre rubber plantation in Ilushin. A £300,000 rubber processing factory is producing crepe rubber at the rate of three tons a day.

●**Malaya**—The Federation of Malaya will have set up a world record in rubber replanting by the end of this year, according to the Natural Rubber Development Board, said a news bulletin published by the Federation's embassy in Washington. The country will have replanted, and newly planted 1.1m. acres. It is estimated that 660m. lb. of rubber will be produced from the one million acres.

●**Ceylon**—Low Country producers in Ceylon have represented that a floor price of 25d. per lb. should be negotiated. In the first pact a floor price of 27d. was set as well as a premium above the world market price. In the present pact China pays Rs.15 million per annum for rehabilitation work and is not bound to a floor minimum price or premium payment. As the agreement requires a price based on the average Singapore price, shippers preferred selling sheet at higher prices in London and New York.

Fire!—422

Plastics at Work

POLYTHENES IN THE HANDLING OF FRESH AND SALT WATER

By DAVID ALEXANDER

FOR many years the problem of cooling has been present in industry and while air cooling is used frequently, greater use has been made of liquid cooling, particularly water. In inland areas this water is drawn from the mains system or rivers and on the coasts from the sea. With the development of new industrial and chemical processes the need for cooling is growing, especially with the progressive use of electricity in the production of chemicals.

At the same time, with the commercial application of atomic energy in electric power stations, there is a very great need for cooling water, this being so important that power stations are very often being located as near to the coast or the sides of rivers as is practicable. In a number of circumstances this may mean the laying of pipelines over a number of miles in order to ensure the supply of the necessary cooling water. Not only with power stations but with the petroleum industry and certain chemical processes, the need for cooling arises, especially where chemical reactions call for sudden and frequent supplies of cold water and where it is not physically possible or permissible to draw their requirements from the mains supply. Therefore pipelines must be laid to connect with a natural source of supply such as a lake, river or the sea.

Use of Traditional Materials

In these circumstances much research has been carried out with traditional materials, mainly metals, and in most cases cast iron is the most frequently used metal. However, in a considerable number of circumstances this has provided, at best, a limited life, and has led to the use of stainless steel in spite of its cost and in some suitable cases to lead-lined systems. Also experiment and use has been made of coated pipelines and rubber-lined steel. In spite of this, the big problem of corrosion still exists in many cases, partly due to the ordinary corrosive effect of certain waters and partly due to the electrolytic action which takes place at certain points in the cooling system when dissimilar metals have to be used; this is especially the case where the water is strained or cleaned of various foreign bodies.

A peculiar thing about water is that its corrosive effect on metals can vary in different parts of the country and even in some instances in different parts of the same river. A particularly interesting example of this is the Thames, where above Shepperton, due to the high oxygen content, the water is particularly corrosive. Yet at Battersea, due to the normally deoxygenated state of the water, this effect is very minor. Further down the river where the estuary starts and where the salt water content is greater, then corrosion difficulties arise again. Also the salt percentage in the salt water varies, also giving localized difficulties. This variation in corrosive effect not only occurs in such conditions, but in some circumstances there can be certain acid and other chemical contents which slowly eat away pipelines.

However, straight corrosion is not the only difficulty. 'Furring' or the build up of chalk-like deposits on pipeline walls reduces the capacity of lines, which can be serious in the case of smaller diameter tube. Deposits also build up in valves, etc. In these circumstances, all materials must be tried eventually, including—very often as a last resort!—plastics. For some time, experiments have been carried out by Metropolitan and other water boards and by various interested public authorities, with plastics. So far it would seem that ordinary polythene, high density polythene and PVC are generally the most seriously considered, with ordinary polythene being, at present, the most widely used commercially. This is probably partly due to the fact that it is the best-known plastic and also there is a British Standard Specification No. 1972 covering the use of polythene tube in water services, while as yet the other two have no BS Specification, although a provisional specification has already been drawn up by the British Plastics Institute covering high density polythene.

Ordinary PVC has been tested and is widely used on the continent for water conveyance, with considerable success. As yet, polythene is not so widely used, this mainly due to the fact that PVC has been established for a very long time, whereas polythene is comparatively new. The tendency seems to be for a change towards polythene, especially since the introduction of high density polythene.

In the UK, ordinary PVC has been tested, but is not used to any extent for commercial water conveyance. However, the introduction of high-impact PVC may well change the present views. A report of this material was given in *RJIP* of December 20. It may well be interesting, therefore, at this stage, to consider and compare ordinary and high density polythene, and later to compare the polythenes with both ordinary and high-impact PVC.

Technical Comparisons

In comparing the two polythenes it is as well first to examine their comparative electrical, mechanical and thermal properties, these are as follows:

	Polythene 1972	Zeigler Polythene
Thermal		
Softening point (Vicat)	91°C.	120°C.–128°C.
Melting point	111°C.	125°C.–130°C.
Coefficient of linear expansion	28×10^{-5} per °C.	16×10^{-5} per °C.
Specific heat	0.55 cal. per °C. per gm.	0.59 cal. per °C. per gm.
Mechanical		
Specific gravity (20°C.)	0.92 (57½lb./cu. ft.)	0.94 (60lb./cu. ft.)
Tensile strength	1,400-1,800lb./sq. in.	3,000-3,500lb./sq. in.
Yield point (20°C.)	1,490lb./sq. in.	2,750lb./sq. in.
Elongation at break (4" per minute)	300-550%	300-800%
Young's modulus	25,600lb/sq. in.	90,000lb./sq. in.
Electrical		
Power factor (tan δ, 10^6 cps)	0.00011	0.0005
Volume resistivity (20°C.)	10^{19}–10^{20} ohm/cm.	10^{18} ohm/cm.
Surface resistivity (20°C.)	4×10^{14} ohms	10^{12} ohms
Dielectric strength (50 cps)	1,000 volts per mil.	1,000 volts per mil.

Another point worthy of note is that by the use of high density polythene as against ordinary polythene, the same pressures can be used as with heavy gauge ordinary polythene tubing made to the BS 1972. From the table below it can be seen that in fact there are slight advantages with regard to pressure when high density polythene is used.

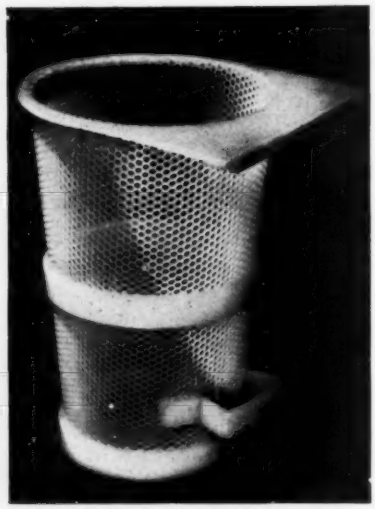
Size (in.)		Maximum working pressures at 20°C.	
		H.D. polythene (in thicknesses of normal gauge BS1972)	Ordinary polythene (heavy gauge to BS1972)
Nominal bore (in.)	Nominal O.D. (in.)	(lb./sq. in.)	(lb./sq. in.)
½	0.686	230	230
¾	1.000	200	150
1	1.250	150	115
1¼	1.500	130	110
1½	1.750	120	95

Also the cost of normal gauge high density polythene is less than the cost of heavy gauge ordinary polythene which in itself effects a saving. Apart from this, the greater rigidity and strength means a quicker and cheaper installation and a neater appearance of pipeline. Due to the rigidity of the high density tube it is not easy to cold bend. The minimum recommended radius for such bends while cold being not less than 12 times the outside diameter of the tube. If, however, the tube is warmed by means of some form of heat such as a blow lamp carefully applied, then bends down to the radius of six times the outside diameter are satisfactory.

Recommended Spacing

High density polythene is available in fairly long straight lengths and the distance between clips is approximately double that of polythene tubing, made to the BS 1972, which recommends the following: The recommended spacing of supports for horizontal pipework is 24 times the outside diameter of the tube up to 1in. bore and and 16 times for over that bore. While for vertical runs 48 times the outside diameter is satisfactory.

When, however, ordinary polythene tubing is used it is possible to lay this by means of a mole plough which in effect lays the polytnene tube as it digs the necessary trench, and in some circumstances up to 200ft. of such tubing can be laid in a minute. It is therefore necessary to assess the particular operating conditions and the circumstances of the area concerned before selecting which polythene to use.



A strainer basket constructed entirely of polythene. (Photograph by permission of KW Chemicals Ltd.)

Strainers in Plastic Materials

As mentioned at the beginning of this article there has been a considerable development in the use of water for various cooling purposes and this has resulted in the extensive use of various straining and cleaning apparatus through which water must pass before entering the factory. There are various types of strainers available made by a number of makers and of different design. The best of these, however, needs regular inspection and cleaning. Also, due to the electrolytic action between these strainers and the surroundings, a considerable degree of preventative maintenance is necessary in order to ensure the continued useful life of the strainer. In many cases the strainer is made from either brass or phosphorbronze and while these materials have proved in most circumstances satisfactory, there are a number of cases where continuous and expensive replacement is necessary and in these instances the use of both ordinary and high density polythene are worthy of serious consideration. Already these materials are in use for such purposes. The illustration shows an example of one such strainer made from ordinary polythene to fit a standard box, this material being drilled to give 40% free area although with the use of high density polythene, up to 50% free area is in some cases possible. From information available it would seem that these plastic strainers are providing a satisfactory answer to a considerable number of difficulties which exist where the water conditions and the chemical composition of the water normally cause corrosion, and also where electrolytic action is taking place.

To summarize, it would seem well worth while for those concerned with the handling of water in bulk to consider seriously the use of plastics, particularly ordinary and high density polythene. There are obvious dangers to the use of these materials, mainly due to lack of technical knowledge with regard to fabrication and welding of these materials and in such circumstances it is probably advisable to have consultations with the plastics engineering company. As previously mentioned the use of both high-impact and ordinary PVC is worth considering as from the information given in a previous article the very great impact strength of high-impact PVC must allow for a very much wider use of plastics than hitherto. As yet the amount of plastics used in the handling of bulk cooling waters is infinitesimal, but it would seem that these materials will have a serious potential future value to this section of industry.

PLASTICS INSTITUTE

Annual Lecture

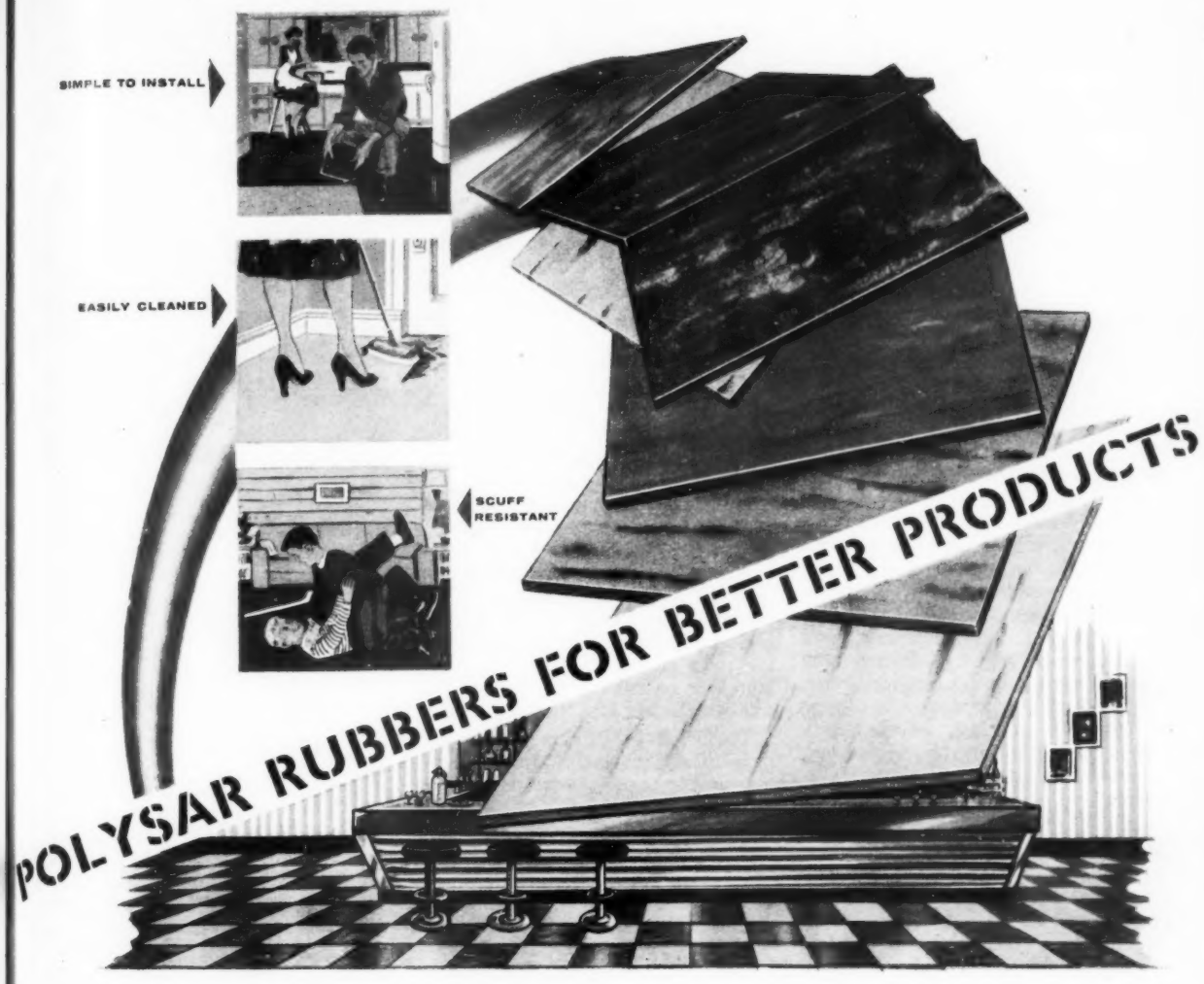
THE 10th annual lecture organized by the Plastics Institute will be held on March 12 1959, 6.30 p.m., at the Wellcome Foundation Building, Euston Road, London, N.W.1. The lecturer will be S. P. Chambers, C.B., C.I.E., deputy chairman, Imperial Chemical Industries Ltd., and his subject, 'International Competition in the Chemical Industry.'

Dunlop Sales in Sweden

Dunlop Rubber Company A.B. of Norrkoping, announced on January 7 that domestic sales of their products have been reorganized as from January 1. The company is to concentrate on sales of tyres and Dunlopillo foam rubber. Each of the company's 'allied products,' the announcement said, would be handled by separate divisions of the group.

US Synthetic Production

The US Department of Commerce on January 7 amended the November figure for production in the US of synthetic rubber. This has been corrected to 102,496 long tons from the figure of 82,892 long tons given on December 30.



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New Tensile Tester

RABRM SOLVE TEMPERATURE UNIFORMITY PROBLEM

By D. G. Lamb*

TRADITIONAL tensile testing machines for rubber have normally used a pendulum to apply and register the force. This has led to the power-driven grip being the lower, downward-moving one for which it has been necessary to provide vertical supports or guides. The use of these supports has meant that it has been necessary to include part of the supports if not the whole machine in an oven for testing at elevated and reduced temperatures.

There are obvious difficulties in enclosing the whole machine in one oven including lubrication and motor insulating problems when running at extreme temperatures, excessive heat or refrigeration requirements, and cumbersome working. When only part of the machine is enclosed there are also difficulties due to heat flow through the supports for the lower grip, non-uniformity of temperature, considerable time required to equilibrate temperature, and changing dimensions of the enclosed parts with temperature change. With the electronic force-measuring device of Payne and Smith[1], there is no longer the necessity to have the bottom grip as the power-driven, moving one.

A tensile-testing machine for use over a temperature range of from 40° to 250°C. has been built at RABRM with a power unit on the upper grip, and such that the power-driven grip is pulled upwards. It is not necessary with this design to provide supports or guides. Coupled with this advantage, a small compact oven could be mounted around the specimen. The power unit is constructed with interchangeable gears giving alternate pulling rates of 0.5in.; 2in.; 12in. and 20in. per minute. Fig. 1 shows the tester with oven in place.

The oven for testing at elevated temperature is shown diagrammatically in Fig. 2. It consists of a cylinder of 18G mild steel 6in. diameter surrounded by another mild steel cylinder 8in. diameter, thus providing a hot air jacket to the oven. This outer cylinder is lagged with 1in. of exfoliated vermiculite and enclosed in a polished aluminium shell. The ends of the oven are each insulated with 1in. pieces of Marinite. The lower piece of Marinite is secured to the knee of the machine, bolted to it is the second piece carrying the lower grip; hence there is no direct metallic contact between the inside of the oven and the knee of the machine. The flexible pipes between fan and heater and the oven are lagged with 1in. diameter woven asbestos rope. The fan is fitted with an extended spindle and the impellor and impellor case are insulated with 1in. thick Marinite from the main bearing casting of the fan, which is belt driven from a 1/30hp motor. Re-circulated air is supplied from the fan, heated in the heater, wired so that connexions can be made with values of 0.5, 1 and 2kw, and introduced into the oven through the flexible pipe tangentially at the bottom. The hot air passes out through holes at the top of the oven, down through the outer jacket of the oven and then returns to the input side of the fan. The oven is mounted in double-yoke levers pivoted on the column of the machine with counter-balance weights on the levers at the back, thus providing means of lifting the oven for easy insertion of specimen in the grips and extensometer.

Temperature control is by means of a Tem-con thermostat and a Tem-con electronic relay. When the heater is working on the 2kw value there are two elements each of 1kw and the thermostat controls only one element. Insulation of the oven proved effec-

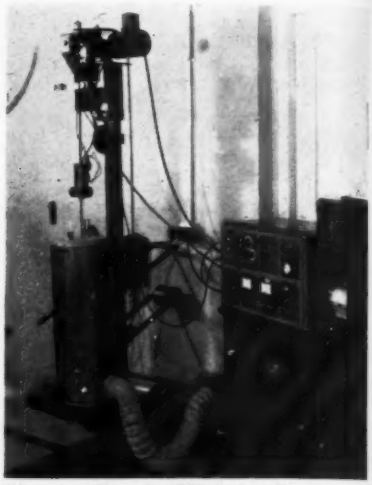

Fig. 1. The RABRM tensile tester with the oven in place. The flexible asbestos lagged pipes connect the oven with the fan and heater. Recording apparatus is on the right

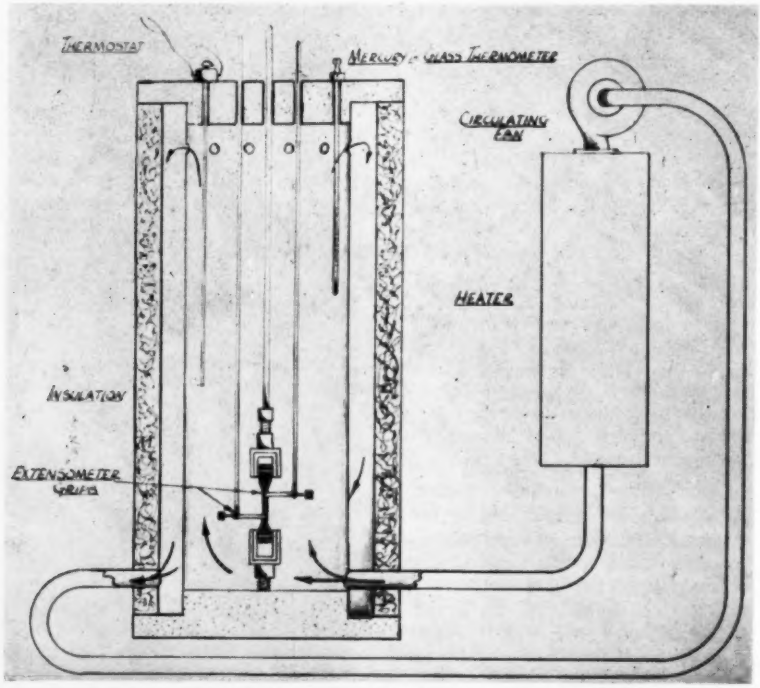

Fig. 2. Heat is supplied to the oven with a heater and circulating fan, and the temperature is controlled with a thermostat. Heat passes up through the inner chamber and returns to the fan via a cavity between the inner chamber and the insulation layer

*Research Association of British Rubber Manufacturers, Shawbury, Shrewsbury, Shropshire.

tive and gave ±1°C. constancy throughout the oven at 200°C.

In this design, however, visual observation of the extension of the specimen was impossible. To overcome this, the extensometer described by Eagles and Payne[2] was adapted, for use with this oven (3 and 4). The adaptation consists of two rods to extend into the oven, on the ends of which are mounted simple spring-loaded grips for a specimen with an original ½in. fixed test length. The rods are suspended by the two ends of a cord passed over a pulley to which is attached a toothed wheel. Contact of the teeth of the wheel with a wiper secured to the bearing housing of the pulley and wheel makes an electric circuit which produces a mark at every 20% elongation on the side of the recorder paper on which is recorded the stress curve. The bearing housing is, in its turn, suspended by a cord passing over fixed pulleys to which is secured a counter-weight. Grips of the type described by Stubbs[3] are used so that in its initial condition the specimen is held straight and enables the extensometer grips to be attached to it.

Low Temperature Testing

Low temperature testing requires the air flow to be from top to bottom in the oven and out from the top of the jacket. The re-circulated air is cooled in a heat exchanger, using methylated spirit, in which solid carbon dioxide has been evaporated as the coolant. The temperature in the oven is maintained by using the thermostat to control the flow of the coolant through the heat exchanger by means of a solenoid valve or by switching the coolant pump motor on or off.

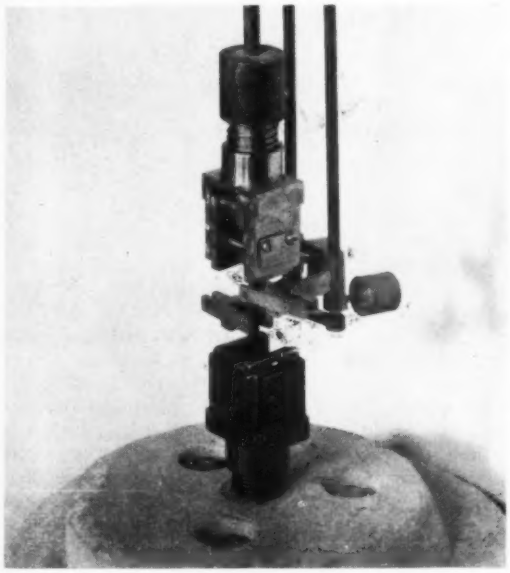

Fig. 3. Visual observation is not possible when the oven is mounted. To overcome this, an extensometer was adapted with two vertical rods which extend out through the top of the oven. The principle of the extensometer is shown in Fig. 4

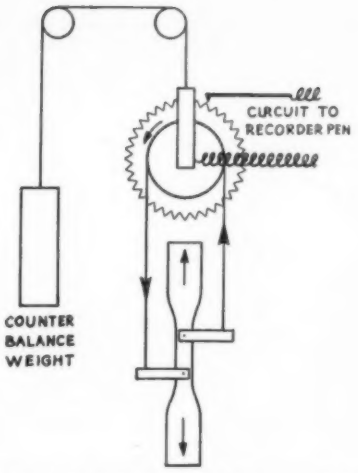

Fig. 4. Principle of the extensometer

Whilst this machine is not operating at a constant rate of stress or constant rate of strain, it should be noted that the rate of separation of the grips is constant as the deflection of the force measuring proof ring can for all practical purposes be ignored. This is an important feature when carrying out stripping tests. For testing at extreme temperatures a miniature dumbbell with a ½in. test length is used, a short time only being required to reach temperature equilibrium. Without the oven, normal standard dumbbells may be tested.

REFERENCES

[1]A. E. Eagles and A. R. Payne, *Rubber & Plast. Age*, 1957, **38**, 811.
[2]A. R. Payne and J. F. Smith, *J. Sci. Instrum.*, 1956, **33**, 432.
[3]A. J. Stubbs, *Trans. I.R.I.*, 1953, **29**, 215.

Plastic Design Display

AT INTERNATIONAL PLASTICS EXHIBITION

THE Design Committee of the Plastics Institute, in association with the organizers of the British Plastics Exhibition, *British Plastics*, and assisted by the Council of Industrial Design, is arranging an international design display at the International Plastics Exhibition to be held at Olympia, London, June 17-27.

For the UK section (13 overseas countries have already indicated their intention of taking part in the 1959 exhibition) the selection committee will make their choice from the Design Index (formerly Design Review), the Council's Index of well-designed articles. Preference will be given to designs included in the Index since June 1957.

All British plastics manufacturers (whether or not they are participating in the International Plastics Exhibition) are invited to submit any articles that come within the terms of reference for the display, *i.e.*, '*well-designed plastics products for use in the home*,' which are not already in the Design Index and which they wish to be considered. They should arrange for them to be sent to the Design Centre, 28 Haymarket, London, S.W.1, not later than May 1 1959. There is no charge for the inclusion of articles in Design Index.

The organizers of the Exhibition have offered an award of 100 guineas together with a suitably inscribed memento to be given to the designer of the best designed article, which will be selected by an international panel of designers from the International Design Display.

Irradiation Vulcanization of Rubbers*

STRUCTURE AND PROPERTIES

THE authors investigated the structure and properties of irradiation vulcanizates of commercial and purified SKB, natural rubber, SKS—30A, SKS—30AM, SKI and of filled stocks based on these, produced by irradiation in an atomic reactor and on a cobalt source with an integral dose of 10^1 to 10^8 r.

The density of the vulcanization network formed during radiation vulcanization is determined by the energy dose absorbed, by the type of raw rubber, by the conditions of irradiation (the medium and the temperature) and by certain other factors.

The output of the number of transverse bonds at 100eV in an air medium for butadiene-styrene extracted rubber is ~12, for natural rubber, extracted, ~4, and for commercial SKS—30A 2.5. The effect of structurization increases with the increase in temperature and decreases in the presence of an oxidation inhibitor (phenyl-beta-naphthylamine).

Radiation vulcanizates have thermo-mechanical stability exceeding vulcanizates with thiuram without sulphur, and show less alteration in properties in the process of chemical relaxation.

In contrast with sulphur vulcanizates there is a dependence of the relative rate of stress relaxation upon the density of the vulcanization network of irradiation vulcanizates. These data give evidence of the formation during irradiation vulcanization of C-C type bridges. The addition of active carbon blacks leads to an increase in the thermo - mechanical stability of radiation vulcanizates.

By means of the infra-red spectra the authors have established the presence of carboxyl, hydroxyl and ester groups in irradiation vulcanizates of natural, butadiene - styrene and sodium-butadiene rubbers produced in air. At the same time in extracted butadiene-styrene rubber at a dose of 60.10^6r. there is observed practically complete disappearance of the double bonds. In commercial rubber, containing the anti-oxidant phenyl-beta-naphthylamine, the decrease in unsaturation with this dose reaches ~30% of the original value.

The authors investigated the capacity for crystallization under stress of irradiation vulcanizates of natural rubber. Irradiation vulcanizates produced at relatively low doses down to 20 to 30.10^6r. have a degree of crystallinity identical with that of sulphur vulcanizates with identical density of network. With increasing dose of irradiation the degree of crystallization falls.

The authors investigated the conditions of production of thick multilayer vulcanizates in irradition vulcanization. It is established that it is possible to produce a uniform vulcanization network independent of the thickness of the test-piece (within the range 0.1 to 40mm.). The mechanical and technical properties of vulcanized rubbers produced by irradiation vulcanization were also investigated.

In comparison with the best sulphur vulcanizates containing an identical amount of filler, the radiation vulcanizates exhibit an increase in resistance to ageing (by 4 to 5 times at 130°) have low permanent set, low hysteresis, high endurance in repeated deformation, and good temperature stability.

The tensile strength of radiation vulcanizates, regarded as a function of the irradiation dose, passes through a maximum, but at the same time does not reach the tensile strength values for the best sulphur vulcanizates.

*By B. A. Dogadkin, Z. N. Tarasova, M. Ya. Kaplunov, V. L. Karpov and N. A. Klauzen (Koll. Zh., 1958, **30** (3), 260-271—*conclusions only*). *Reprinted by permission from Translation No. 669 prepared by the Research Association of British Rubber Manufacturers.*

Argentine Imports

NEW SYSTEM ANNOUNCED

ARGENTINE import trade on January 6 officially came under the new system announced by President Frondizi at the end of December. Imports are now based on the new single fluctuating free exchange rate for the peso. They are also subject to surcharges of 20, 40 and 300%, according to their importance to the country, apart from a refundable customs bond which will be applied accordingly.

Tyres are included in the list of goods paying a 40% tax plus customs bond ranging from 50 to 300% of the C and F. value of merchandise which is refundable after six months. Items not listed will, in addition to a 300% tax, be subject to a customs bond of 500%. These include motor cars which are also subject to prohibitive internal duties.

Announcing the list of goods at a Press conference on January 6, the President of the Argentine Central Bank, Sr Jose Mazar Barnett, said they would take immediate effect. However, bank officials expect that actual operations would not start until January 12 when the foreign exchange market re-opened after being closed for 14 days.

Pump impellers for both sump and jet water pumps, formerly made from cast bronze, are now fabricated by the Barnes Manufacturing Co., Mansfield, Ohio, by injection moulding as a single unit from Kralastic, a resin-rubber blend produced by the Naugatuck Chemical Division, United States Rubber Co.

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News for the rubber industry! Stearic Acid is now available in 'bead' form. Made by Price's for Columbian International, STEAREX beads possess unique advantages over other forms of Stearic Acid — at no increase in cost.

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Research in Ceylon

REPORT OF THE RUBBER RESEARCH INSTITUTE

RUBBER is the second most important export crop in Ceylon, after tea, and this reason alone justifies the intensive work of the Rubber Research Institute of Ceylon whose report for 1957 was published recently. It is clear from this detailed account that an unusually wide range of research activities is continuing over a broad field comprising the four main departments of botany, plant pathology, agronomy and chemistry.

Activities in the Botany Department included both field experiments and advisory work, the latter covering all aspects of rubber planting including suitable planting material, tapping systems, cover crops and the care of planting material. The field experiments of the department now extend over 800 acres on three estates, the greater part of which has been planted with material produced from hand-pollination programmes carried out each year from 1939. Preliminary results of this programme should soon begin to be available.

Other experiments now in hand include field trials on wide avenue planting systems, selective thinning out of initial high stands of budded and seedling rubber, crown budding with low yielding disease-resistant clones and comparison of the yields of clones and clonal seedlings.

Incidence of Plant Disease

From the report of the Botany Department, as elsewhere in the document, it is clear that Ceylon is anxious to seek the assistance of other natural rubber areas and during the year under review a number of disease-resistant clones were obtained from the Plant Introduction Station, Coconut Grove, Miami, USA.

Much of the time of the Plant Pathology Department during the year was taken up with advisory visits and in the supervision of long-term experiments, which were mainly concerned with the breeding of resistant clones and crown budding operations.

In regard to the diseases of rubber, it was found that the incidence of *Oidium heveae* during the 1957 season was mild in most districts and capable of effective control by routine sulphur dusting. On the other hand, the leaf disease caused by *Phytophthora palmivora* was much more serious during this particular year and experiments were conducted on a total area of 359 acres, on nine estates in different districts.

Three main groups of fungicides were tested, namely, copper-based, organo-metallic and organic but the copper-based material was found to be both the most effective and the most economic. Encouraging results are also reported from tests with new fungicides against *Phytophthora* bark disease, the black stripe and the canker disease.

Agronomy Progress

An unusually heavy programme of visits was carried out by the Agronomy Department in 1957, including a considerable number of reconnaissance visits to possible new sites for the manurial experiments which naturally form a large part of the department's activities. In addition to the search for new sites, visits were also made to the numerous existing sites where manurial trials are already in progress, including a number of NPK experiments which are producing interesting results.

In the department's laboratory work, soil analysis played an important part and more than 200 soil samples were examined in considerable detail, including examination for pH, mechanical composition and N, P and K.

An interesting feature of the department's work during the year and an indication of the problems it has to face, is provided by the section of the report dealing with the construction of a new greenhouse which is 40ft. x 15ft. x 7ft. in size and replaces the former temporary structure. Some problems arise in the construction of a greenhouse in tropical conditions but by taking care with the ventilating cycle a suitable building has been erected. The local fauna causes some difficulty, however, for the report states: 'A minor problem in the greenhouse is the entry of squirrels and lizards and it might be desirable to line the inside with fine chicken wire or even mosquito mesh.'

An echo of the work of the Plant Pathology Department appears in the work of the Chemistry Department which was largely concerned during the year under review with work on the problem of contamination when dusting formulations are used against *Phytophthora palmivora*. Large numbers of samples were examined by the department after the dusting season and the copper content of the processed scrap samples was carefully tested. On the basis of the findings, it is suggested in the report that with proper care in dusting procedures in the field and if there is careful testing and blending at the factories where the fungicides are prepared, it should be possible to reduce the contamination to lower proportions still.

Two other sectors of the Research Board's operations deserve mention, namely the Smallholdings and Estates Departments. The increase in the work of the Smallholdings Department was largely due to the issue of a fairly large number of replanting and new planting permits and the expansion of the sulphur dusting scheme for smallholdings.

Rubber instructors conducted 240 sheet-making demonstrations while instructors also paid 1,917 visits to smokehouses. As evidence of the way in which the department is bringing the latest practices to smallholders may be mentioned the fact that in addition to the sheet-making demonstrations there were 107 tapping, 394 disease control and 189 miscellaneous demonstrations.

Estate Production

A total of 225,991lb. of rubber was produced during 1957 by the three estates (Dartonfield, Nivitigalakele and Hedigalla), the yields per acre being 632lb., 854lb. and 447lb. respectively. The overall average yield was a satisfactory 653lb. per acre, in spite of unusual weather conditions.

In regard to finance, the rubber research cess was increased from 55 to 82½ cents per 100 lb. of rubber exported from Ceylon. This has enabled the board to obtain the income necessary for its five years' programme of development earlier than would otherwise have been possible.

Estimated total income for the financial year 1958 was 2,050,991 rupees (£154,000) compared with estimated expenditure of 2,696,713 rupees (£177,250) of which 964,440 rupees (£72,000) represented capital expenditure.

Mr John L. Burden and Mr Douglas A. Cross have been appointed to the board of the Yam Seng Rubber Company. They replace Mr R. A. Cacutt and Mr B. W. Meaden, who have resigned.

UK Plastics Sales

SALES of plastics materials in the third quarter of 1958, according to Board of Trade figures just released, showed some recovery compared with a year earlier and at 96,700 tons were over 3% above the corresponding period of 1957. The high stock build of plastics materials that occurred in the first half of the year did not continue in the third quarter, but total stock remained high compared with a year ago.

Sales of thermosetting materials at 40,200 tons were about the same as a year earlier and the production rate remained about the same as a year earlier. Sales of thermoplastic materials, which now account for almost 60% of the total sales of plastics materials, at 56,500 tons showed an increase of some 6% on a year earlier. Stocks of thermoplastic materials rose slightly during the quarter and the production rate was some 5% above a year earlier.

Exports of all plastics materials in the quarter at 27,500 tons were at a high level. Imports at 10,800 tons were the highest quarterly total so far recorded.

The figures in the following table were compiled from returns from over 150 firms known to have been manufacturing plastics materials, whether for sale or for use in the production of plastic goods or incorporation in other goods (*e.g.* paint) containing plastics materials. Firms making cables who manufacture plastics materials from purchased resins are excluded. Synthetic materials for use as textiles are also excluded. The figures are free of duplication or double counting of plastics materials at different stages of production.

Net sales and stocks of plastics materials expressed in thousands of tons

	1957				1958		
	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	1st Qtr.	2nd Qtr.	3rd Qtr.
Net sales:							
Thermosetting materials:							
Alkyds	10.5	12.0	10.7	10.3	11.1	11.4	11.1
Aminoplastics	13.5	12.2	11.8	13.1	13.2	12.1	11.3
Phenolics and cresylics	16.9	16.3	15.5	17.9	16.6	15.9	15.2
Polyesters	0.7	0.7	0.8	0.9	1.1	1.1	1.1
Other (including casein)	1.6	1.7	1.5	1.5	1.5	1.6	1.6
Total thermosetting materials	43.2	43.0	40.3	43.7	43.5	42.1	40.2
Thermoplastic materials:							
Cellulose plastics	3.0	3.1	2.9	3.3	3.5	2.7	2.5
Polyvinyl chloride*	15.4	16.6	16.8	17.4	18.4	17.2	17.2
Polystyrene	7.3	7.4	7.8	8.7	8.3	8.1	7.5
Other†	27.6	29.5	25.7	30.5	29.7	27.8	29.3
Total thermoplastic materials	53.3	56.5	53.2	59.9	59.9	55.8	56.5
Total all plastics materials	96.5	99.5	93.5	103.6	103.4	97.9	96.7
Stocks at end of period:							
Thermosetting materials	16.6	16.0	15.6	16.8	16.5	16.0	15.5
Thermoplastic materials	25.7	24.8	26.3	27.9	31.7	36.9	37.6

* Excluding sales of resins (*i.e.* polymers sold as such).

† Including acrylics, polyamides, polytetrafluorethylene, polyethylene, polyvinyl chloride resins (*i.e.* polymers sold as such), polyvinyl acetates.

Midland Silicones Appointment

Midland Silicones Ltd. announce that Mr John Acton, M.Sc., A.R.I.C., has been appointed New Products manager. This is a new post. Mr Acton will be responsible for launching and marketing all new silicone, or silicone-containing, products developed by Midland Silicones, Ltd. In the last few years, over 2,000 new silicone products have been developed—and of these a considerable number have passed pilot plant stage. The company today operates the largest silicone producing plant in Europe, at Barry in South Wales.

JOHN ACTON

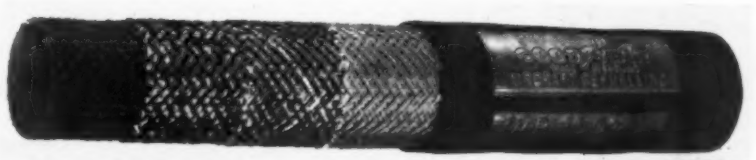
Mr Acton first joined Midland Silicones Ltd. in 1955 as a technical representative. Latterly, he has been in charge of MS sales in SE England. Educated at the Northern Polytechnic, where he took his degree in organic chemistry, he joined the staff of Midland Silicones from Union Carbide, Ltd.

Mr K. M. G. Anderson has been appointed chairman of Kimanis Rubber in place of Mr Charles Mann, who has retired from the board. Mr John M. Gullick has been appointed a director.

Du Pont Changes

The Du Pont Company has announced new appointments in its British branch. Mr David H. Conklin, managing director of the Du Pont Company (UK) has been appointed to the new position of European director of the international department with headquarters in London. Mr William H. McCoy becomes managing director in London in succession to Mr Conklin.

Mr C. G. C. Harvey has resigned from the boards of Fothergill and Harvey and its subsidiary and associated companies.



Smooth bore high pressure aircraft refuelling hose manufactured by the Goodyear Tyre and Rubber Co. (Great Britain) Ltd. is being used at London Airport for refuelling the BOAC Comet IV, and it is also being applied in a number of other duties in aviation. Built to withstand a maximum working pressure of 150 psi, it is usually operated at 50 psi whilst carrying kerosene fuel at a rate of up to 200 gallons per minute. Two fuelling points are used on the Comet which is filled to its maximum capacity of 9,026 gallons. An interesting feature of the hose is its incorporation of two strands of tinned copper-braided earthing tape built in to ensure positive electrical continuity. This measure renders the hose proof against dangerous charges of static electricity

New Dunlop Film

Magnificent photography, well illustrating the fascination and mystery of underwater life, is a feature of the latest Dunlop film, 'Horizons Below.' A film for general audiences produced by Technical and Scientific Films Ltd., in association with the Film Producers Guild and shot in Eastmancolour, it shows that ordinary swimmers, thanks to the clothing and equipment manufactured by Dunlop, can remain underwater for long periods without surfacing.

In the early stages of the Second World War, when the Royal Navy's problem was to provide an underwater task force of midget submarines, Dunlop were called in to help in the designing of a special close-fitting diving dress. Later, as shown in the opening stages of the film, frogmen played a vitally important part in the D Day landings.

Today, men and women of all ages swim underwater to experience the enjoyment of seeing things under the sea. In the film, members of the British Sub-Aqua Club are seen exploring the secrets of the sea and introducing two less experienced friends to the pleasures of underwater swimming. The colour is outstanding, the story entertaining, and the film well shows the types of clothing available.

'Horizons Below' is available in 16m.m. sound for private showing, from the Dunlop Film Library, Wilton Crescent, Merton Park, London, S.W.19.

A shot from the new Dunlop film 'Horizons Below'

ASTM Standards for Plastics

A new edition of 'Compilation of ASTM Standards on Plastics' has been released by the American Society for Testing Materials. This edition, like that of 1957, is the work of the ASTM Committee D-20 on Plastics, the difference between the two being the addition of 43 new standards, which include specifications for non-rigid vinyl chloride plastic sheeting (D1593); glass fabric reinforced epoxy resin laminates (D1592); and polymethylstyrene moulding and extrusion material (D1595).

New material includes a group of standards on plastic pipe with specifications covering dimensions of SWP and IPS sizes for cellulose acetate butyrate, and acrylonitrile-butadiene-styrene pipe. Also included are methods for short- and long-term hydrostatic pressure tests of plastic pipe. These pipe standards have been developed jointly by the ASTM and by the Society of the Plastics Industry.

Also included in this new edition are tentative abbreviations of terms relating to plastics (D1600). These new abbreviations have been developed in an effort to standardize a short-hand notation for some of the more generally used complicated chemical names. For example: acrylonitrile-butadiene-styrene plastics in the new notation are simply ABS plastics.

All of the 191 ASTM standards applicable to the plastics industry appear in the new edition which runs to 1,108 pages. Copies may be obtained from *RJIP* Book Department at 65s. including postage.

Mr D. W. Hills has been appointed a director of Turner Bros. Asbestos Company and of Glass Fabrics, subsidiaries of Turner and Newall.

Appointments

New appointments in their belting division are announced by Dunlop. Mr T. A. Brooke becomes works manager at the Speke factory with overall responsibility for production and engineering work in the division; Mr E. Harrison is appointed production manager; and Mr P. J. Bawcutt, methods and equipment manager.

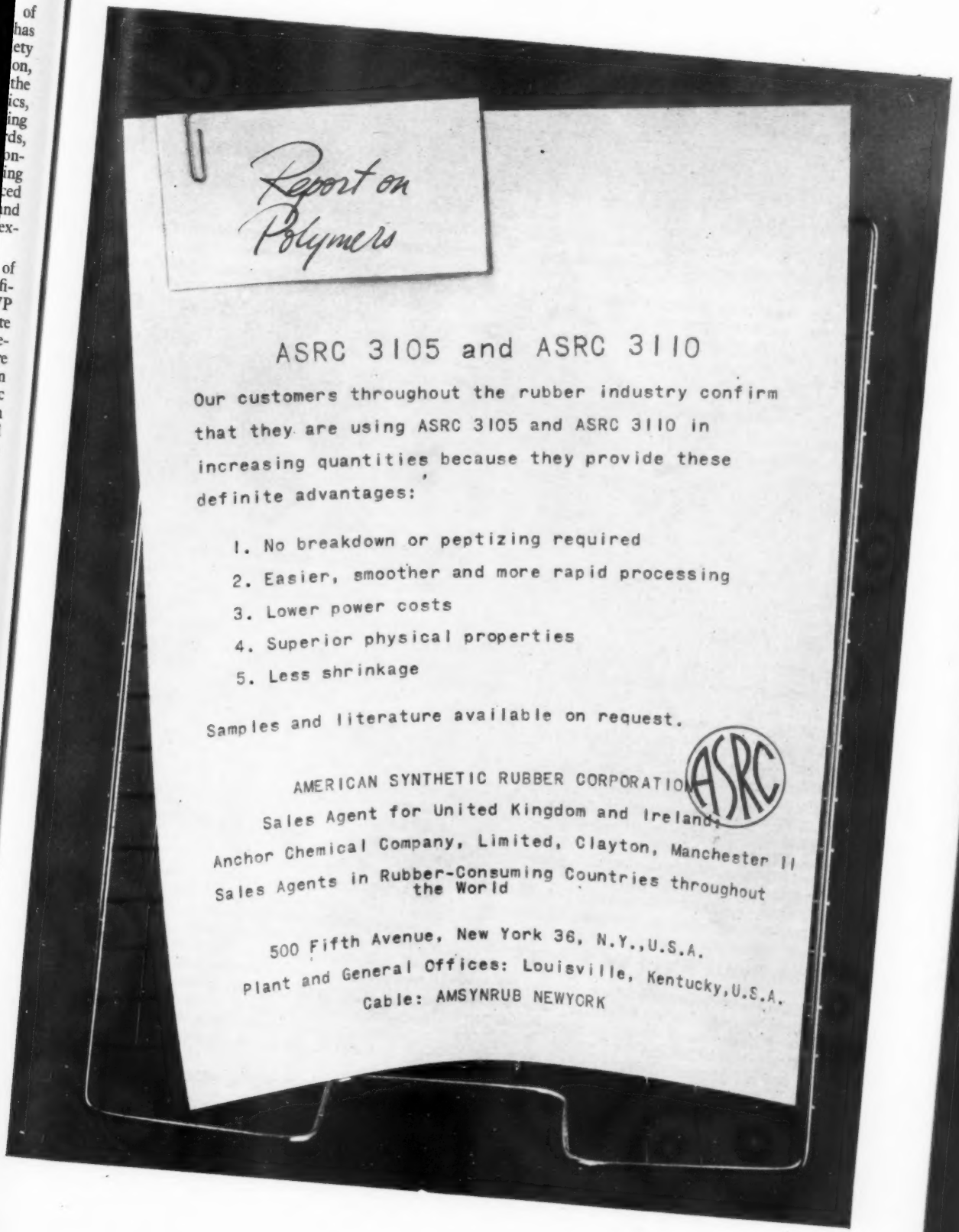
Mr R. W. Lunn has been appointed chairman of the Leyland and Birmingham Rubber Company. He succeeds the late Mr H. Berry.

1957 Census of Production

THE first provisional results of the census of production for 1957 have now been published by the Board of Trade. The gross output of plastics materials in 1957 is given as £120.4m. This figure compares with £104.2m., £99.1m., and £83.1m. for 1956, 1955 and 1954 respectively.

The rubber industry, too, experienced a continued increase in output. The gross value for 1957 was £263.6m. compared with £262.0m. for 1956, £252.3m. for 1955 and £221.3m. for 1954. Numbers employed in rubber were 1,100 less than in 1956, but at 108,600 were still 1,600 more than in 1954. The sum paid in wages and salaries amounted in 1957 to £61.8m., which compares with £50.4m. in 1956 and £49.2m. in 1954. Total capital expenditure amounted to £14.9m.

These figures are based on a sample enquiry which, for 1957, accounted for about 70% of the total output.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VIEWS and REVIEWS

Polymer-Modified Rubber

A PAPER which forms part of the programme of research of the British Rubber Producers' Research Association, the title of which is: 'Bulk Polymerization in Natural Rubber Swollen by Methyl Methacrylate,' by P. McL. Swift, has recently appeared in the *Journal of Applied Chemistry* (1958 vol. 8, 803-810).

Previous Research

In previous work by Bloomfield, Merrett, Popham and the present author, polymer-modified rubbers containing a substantial proportion of graft polymer were prepared from natural rubber latex, using an amine-activated peroxide as initiator.

Considering that dry rubber 'is cheaper than latex,' Swift thought that it would be of interest to investigate the preparation of similar materials in a mass of dry rubber which had been allowed to imbibe the necessary quantity of monomer. The aims of the investigation were, therefore, (a) to assess the conditions which obtain during such polymerizations, (b) to evolve a process which works within the limitations imposed by these conditions, and (c) to evaluate the products.

Summary of Results

(i) Methyl methacrylate was absorbed into dry NR, and polymerized under conditions of low heat loss, using as initiator AZBN (*Azobis*-iso-butyronitrile), alone or in combination with an activated peroxide. No graft polymer was formed when AZBN was used as the sole initiator. With a mixed catalyst system (*cf. details in paper*) polymerization starts at room temperature.

(ii) The process has been carried to a semi-technical scale, and as to the properties of the products obtained, it was found that, in general, the materials resemble the corresponding materials prepared in natural rubber latex, but have 'markedly better hot-tear resistance.' With the appropriate mixed catalyst system about 25% of the polymethyl methacrylate is present as a graft polymer.

Bituminous Road Surfacings

Amongst the other communications in the issue of *Applied Chemistry* quoted above is one on 'Some Factors Influencing the Behaviour of Bitumen Road Surfacings' by G. M. Dormon (Shell Petroleum) and A. W. Jarman (Shell-Mex and B.P.), pp. 832-848.

This is a paper which must be studied in detail by those closely interested, but the problems discussed are set out in the summary as follows:

'The concept of the stiffness of bitumen (ratio of tensile stress to tensile strain) and methods for its determination are described with special reference to the behaviour of road surfacings under different conditions.'

'The mechanism of the failures of road surfacings (cracking, deformation under load, and fretting) and factors which may interfere with expected functions of the mixture (durability and adhesion) are set out in detail.'

Conclusions

The authors' Conclusions commence with the following: 'The mechanical properties of bitumens have been shown to be dependent both on the temperature and the duration of the applied stress; both influences are important and must be taken into consideration when studying bitumen application problems. The behaviour of a bitumen under stress can be expressed in terms of its tensile strength and its stiffness. Since, under conditions of practical interest, the tensile strength of all bitumens is approximately the same, the mechanical behaviour can be described adequately by stiffness alone, and this may be deduced with sufficient accuracy for general purposes from the penetration and softening point (R and B). The use of these two methods as the basis of existing specifications is thereby endorsed.'

Practical Significance of Tests

The opinion expressed by the authors as to certain aspects of testing is certainly of considerable interest as bearing on the practical aspect. They remark:

'In the past, however, the practical significance of the penetration and softening point tests has not been fully understood, and they have been supplemented by the use of other empirical tests, while in some quarters bitumens have been characterized by the country of origin. The work described in this paper has been carried out with bitumens of a variety of origins, representative of normal supplies in Europe, and in every case the performance of the bitumen has been in accordance with the mechanical properties as described in terms of stiffness. The stiffness concept, by introducing a time dimension, affords a better and more fundamental approach than that previously used.'

New Instruments

Two new instruments, the Microviscometer and the Microelastometer are discussed and illustrated in the paper. In their 'Conclusions' these are referred to as enabling accurate determinations to be made in the critical regions of very low and very high stiffness 'where very small differences may be important, and thus to avoid errors which may arise by extrapolation from measurements made in the normal range using the penetration and softening point tests.'

Particulars of the instruments, and of other details, etc., will be found in the paper discussed above.

High Efficiency Filter

In the December 1958 issue of *Industrial and Engineering Chemistry* (Vol. 50 (12), 30A) there is an interesting feature headed 'Spray Yourself a Filter,' a sub-heading of which is 'High Efficiency Filters for Small Particles can now be produced by a simple technique.'

It appears that (*for reasons cf. article*) the Cambridge (US) Air Force Research Centre gave the Stanford Research Institute the job of finding a simple way to

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **DR SCHIDROWITZ**

achieve the desired technique, and 'A group at the Institute under the direction of R. D. Cadle came up with the answer—a spray gun.'

The Process

After—understandably—a good deal of research, the process which finally emerged was along the following lines:

A 10% solution of polystyrene in methylene chloride is fed through a jet under positive air pressure of 50 psi. This concentration is such that the aspirated solution comes out in threads rather than in droplets. It appears that the solvent evaporates almost instantaneously, leaving thin filaments of polystyrene ½ to 3in. long. Under the correct conditions these filaments constitute cylindrical fibres slightly less than 1 micron in thickness. These fibres are collected on a 2ft. square piece of Dacron mesh which is supported vertically about 4ft. from the atomizer, suction behind the mesh helping to collect the fibres. 'The mesh packing is then carefully peeled off and the mat is rolled under a force of about 10lb., to increase its strength and filter efficiency.'

Results

The filters prepared by the process have, it is stated, collection efficiencies of over 99.5% for particles about 0.05 micron in diameter. The pressure drop across the filter at a standard flow rate of 14cm. per second is about 100mm. of water, 'but there are indications that this can be decreased by some further modifications of the fabrication technique.' (The author of the note is 'R.G.N.')

Packaging

At a joint meeting of the Edinburgh Sections of the Society of Chemical Industry of the Royal Institute of Chemistry, and of the Chemical Society held in Edinburgh on November 13 1958, a paper by Dr G. L. Riddell on 'Packaging' was delivered and discussed, with Dr A. M. Smith (chairman of the Edinburgh *SCI* Section) in the chair. The remarks that follow are based on a report published in *Chemistry and Industry* (December 13 1958, p. 1646).

The packaging industry, Dr Riddell remarked, was larger than was generally appreciated, and this was emphasized by a reference to the wide variety in type, size, content and function of packages.

However, a description of the work of a packaging laboratory dealing primarily with paper-based products would serve to illustrate the significance of the main functions of a package, and how they were measured.

Tests

Appearance apart, the main function of a package was protection, and in this connexion the lecturer described tests of strength, by tumbling, dropping, impact, and vibration. Such tests were in addition to tests on the materials used as such.

A second function—namely that of a moisture-vapour barrier—represented exclusion, inclusion, or partial transmission of moisture vapour, as the case might be, and Dr Riddell outlined the methods used to determine this moisture transmission under controlled conditions.

Figures relating to various conditions of climate were shown and, of particular interest, as it seems to me, must have been those showing the harmful effect of creasing on permeability.

Functions/Conditions

In connexion with other functions of the package, *e.g.*, gas permeability, resistance to liquid penetration, to moulds and bacteria, to insects, and to light and heat, the lecturer pointed out the great importance in this regard of circumstances and conditions, and outlined the methods used for achieving the relevant properties, and in some cases the tests used to determine the suitability of materials.

Discussion

Amongst the answers by Dr Riddell to the numerous questions, the following may be noted:

It is unlikely, on economic grounds, that paper cartons will replace glass bottles as milk containers in the near future in this country.

The problem of the puncture of paper bags by sharp edges of blocks of paraffin wax might be solved by melting the wax into the bags. The trouble caused by failure of the corners of paper bags which are filled with liquid sugar might be obviated by using a different form of container; *e.g.* a polythene bag in a fibre-board case.

The relative merits of polythene and glass depend largely on economics, but one property of polythene which has not always been appreciated is that it is not impermeable to all gases.

PHILIP SCHIDROWITZ

Rubber Wage Negotiations

FURTHER BREAKDOWN

YEAR-LONG wage negotiations between Malayan planters and plantation workers broke down again on January 11. The Malayan Planting Industries Employers' Association and the National Union of Plantation Workers reached agreement on a new wage scale for rubber tappers, but were unable to fix on a minimum operating period.

The new scale, according to association secretary J. A. T. Perera, will give tappers a minimum wage of 2.20 Straits dollars a day when the price of rubber is between 60 and 70 cents a lb. If the price falls to between 50 and 60 cents tappers will get two dollars a day. The agreement provides for an extra 14 cents a day for each jump of 10 cents in the price above the 70 cents mark. The new agreement also provides for an output payment as an incentive to production. The Association said it wanted the agreement to stay in force for 18 months so that it could be given a trial over an adequate period.

The Union said in a statement that it accepted fully the structure of the new wage proposals, but it wanted the duration of the agreement to be no more than 14 months.

Imports to France

A wide range of raw material imports from the dollar area and from non-OEEC countries was officially freed from quota restrictions on January 13. This follows France's decision to raise the percentage of liberalization on dollar goods from 13% to 50% announced at the end of last year.

Goods which figure on the list published in the *Journal Officiel* for January 13, include natural rubber—for the dollar area only.

Questions Corner—55

(Second Series)

239. Carboxy methyl cellulose is used as a thickening agent in water solutions. Give some details.

240. What are the properties and uses of ethyl hydroxyethyl cellulose?

241. Give some details of dimethyl phthalate and its uses.

242. Explain how thermosetting resin adhesives are formed and give an account of the various types.

(Answers next week)

Answers to Questions Corner—54

235. The resin injection process for producing glass fibre reinforced plastics was developed by the Bristol Aircraft Ltd. owing to the need for producing consistent and void-free mouldings essential for aircraft components. Details of the work are given in *Plastic Progress 1955*, 341; *1957*, 131; *Br. Plast. 1956*, **29**, 294. The process consists essentially of forcing a resin, under controlled conditions, into a mould in which the glass fibre has previously been laid.

The injection system is the latest development in which two separate vessels hold accelerated resin and catalyzed resin respectively. By a system of turncocks, air is admitted to the former and the resin forced into the mould which is already filled with glass fibre previously washed with the catalyzed resin to remove air bubbles in the packed fibres. The fibre must be free of moisture and for this purpose hot air is forced through the die from a 'Humidryer.' The turncocks are automatically controlled by an electrical tuning mechanism, and the carrier holding the mould traverses a given distance at pre-determined intervals so that the three stages are synchronized.

Two vessels containing acetone are used to force the liquid, under pressure, through the resin pipe-lines for periodic cleaning when required.

* * *

236. Several methods have been tried for the chlorination of polythene and one of the earliest was that in which the polymer was dispersed in carbon tetrachloride, or acetic acid, and then treated with chlorine gas (BP 481,515). The reaction was slow so catalysts were used to accelerate the reaction, *e.g.* iodine, ferric chloride, etc., but it still required several days to absorb even 50% chlorine.

The reaction can be accelerated by raising the temperature (USP 2,389,803), or by reacting in the presence of artificial or natural sunlight (USP 2,422,919; 2,481,188), and certain azo compounds are stated to have a similar effect (USP 2,503,252). The addition of chloroform prevents gelation during the reaction (BP 705,974).

Water can be used as the suspension medium and the reaction conducted at about 50°C. until about 40% chlorine has been introduced and then the temperature can be raised to 75°C. until completion (USP 2,592,763).

The effect of chlorine substitution on the properties of the polythene is a reduction in the tendency of the chains to crystallize and consequently a lowering of the softening point. (*Trans. Fara. Soc. 1946*, **42A**, 197.)

Chlorinated polythenes lose hydrogen chloride and degrade on exposure to elevated temperatures or U-V light, unless stabilized with various materials, *e.g.* glycidyl laurate and a metal deactivator (USP 2,541,492), lead, sodium or potassium salts (USP 2,364,410), phenyl salicylate or resorcinol dibenzoate (BP 538,871).

* * *

237. The preparation of viscose yarn was first discovered by two famous workers in the chemistry of cellulose, C. F. Cross and E. J. Bevan, in 1891. It is made from regenerated cellulose and the starting raw material is wood pulp which is preferably made from Norwegian or Canadian spruce. Pulp sheets are steeped in an upright position in a caustic soda solution. Next the solution is drained off and part of the soda removed by squeezing, leaving approximately 2 parts soda to 1 part cellulose.

After this the sheets are disintegrated and stored in boxes for a few days, at a controlled temperature, to 'mercerize' them. The amount of oxygen absorbed determines the final viscosity of the solution. After mercerizing, the crumbs are taken to a churn and treated with carbon bisulphide which changes the material to an orange-red sticky product which is soluble in water and called cellulose xanthate. The xanthate is dissolved in water, or weak caustic soda solution, and the solution is then run off and filtered.

Then follows a period of 'ageing' which consists of the removal of some of the carbon disulphide which forms by-products. The solution, after ageing, is then conveyed to the spinning machine and extruded through a jet, called a spinneret, into a bath of dilute sulphuric acid and other chemicals. The cellulose is precipitated and can be extruded as a filament.

* * *

238. Some synthetic fibres are practically circular in cross-section, *e.g.* nulon, and this is common with those fibres that have been spun from a melt. Those fibres that are spun from a solution have a kind of dumb-bell section, *e.g.* Orlon. As the filament leaves the jet it collapses as the solvent evaporates, or is removed in some way. Those fibres which are produced by solution in wet spinning will also have a similar shape, *e.g.* viscose or alginate. Cellulosic fibres vary in shape. Cuprammonium fibres are practically circular, cellulose acetate are lobed and viscose rayon are somewhat serrated. However, if wet-spun fibres are stretched during the spinning they will have a practically circular cross-section, *e.g.* Acrilan.

Generally it is desirable to have a uniform cross-section with any fibre, but the shape does have some bearing on the physical effects. Flat sections have a very good lustre but, on the other hand, have a very harsh feel. Circular sections have a soft feel but with poor covering power. The good feel of cellulose acetate fibres is partly because of its lobed section and it gives a somewhat better covering power than fibres with a circular section.

Filaments with other types of cross-section have been tried and are still being developed and there is some evidence that a triangular shaped filament gives increased covering power and lustre. Yarns of mixed filaments are also being tried. Polyvinylidene chloride monofilaments (Clorene) are available in circular or elliptical cross-section. Filaments with flat sections give more covering power and resemble Panama straw in appearance. There is an excellent series of photographs of various fibres in *Identification of Textile Materials*, 4th Edn., 1956, The Textile Institute.

(More questions next week)

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MEN and MATTERS

A Review of People and Events

by George A. Greenwood

WELL, we have certainly been in the news again during the past week or so—both rubber and plastics—and to some purpose! The motif so far as plastics was concerned was, of course, the publication of estimates to the effect that sales of all materials were about 3% higher in 1958 than they were in 1957 although it was added, stocks, particularly of thermoplastic materials, continued to increase during the twelve months.

What interests me, however, is the fact that such a large section of the general Press should have considered the figures to be worth-while reproducing, and in some cases giving quite a fair amount of space. We can be certain that nothing like that would have happened 20 or even 10 short years ago—another example of the way in which the industry has scored in significance, and soared in the public estimation.

From the rubber angle the accent has been, of course, especially in those yearly financial and industrial reviews, on fluctuations in supply and prices and the increasingly significant part which Russia is playing as a consumer in world markets, but here again some of the popular newspapers are now taking to writing about rubber as they do about the more obvious materials in domestic use. Both the gossip writers and the paragraphists have been busy about the new process for preserving latex against deterioration caused by bacteria or by chemical action, and giving the consumers, particularly those in the domestic sphere, some interesting and reassuring information upon the lines of which the industry is, of course, well aware.

Now I think that all this is very much to the good. In one way or another the scribes are doing for the two joint industries, in their own way as news men, probably more than the industries could do in any direct way for themselves. And what could be better than that!

£100,000 for Science

When Sir Alexander Fleck, F.R.S., made his last speech upon his retirement as president of the British Association the other day, the chairman of I.C.I. announced as 'an interim report' that the Association's second appeal for funds launched after the annual meeting at Glasgow in September had led to promises totalling nearly £100,000. As already announced, following the ending of his term of office in the 'BA,' Sir Alexander is accompanying the Duke of Edinburgh on a considerable part of his industrial and scientific tour of the Far East and other parts of the world—at the Duke's invitation.

One of the most interesting features of the statement to stockholders from Sir Walker Shepherd, chairman of Turner and Newall Ltd., for the annual meeting to be held in Manchester next Tuesday, deals with expansions. It states that construction of the new premises for J. W. Roberts Ltd. at Horwich, near Bolton, has been recently completed, enabling the company's commercial research and development activities to be moved from Leeds to more suitable accommodation there. Despite adverse trading conditions, turnover in Sprayed 'Limpet' Asbestos has been increased substantially 'while encouraging progress has also been made in "Ferobestos" technical plastics.'—I quote the statement.

A belated but interesting note is that in the New Year Honours List, Chief Fire Officer Clifford Kent, head of the fire services at the Scandinavia Mills, Cleckheaton, of British Belting and Asbestos Ltd., received the British Empire Medal. He is 57, and has been in the service of the company in various capacities for 36 years.

Mr Ian Geoffrey Laing who is a well-known personality with Ciba Ltd., the chemicals and plastics concern at Basle, has been awarded the Ph.D. degree of Leeds University. He had already obtained his B.Sc. with honours in 1955 and had won three gold medals in City and Guilds examinations.

Industry Interest

Among the many pleasant aspects—I can't think of any bad ones—of the rubber industry's relations with its Institution is the support given to the social functions organized by the various IRI sections.

A case in point was the recent annual dinner and dance of the Manchester Section. On that occasion, Mr C. H. Birkitt, the chairman, was able to announce that a very large number of firms had sent in donations for the purpose of providing gifts for the ladies. As can be seen, the list is most impressive, donations being received from the following companies:

Anchor Chemical Co. Ltd., Joseph Anderson and Sons Ltd., Bank Bridge Rubber Co. Ltd., Boro Rubber Co., Britannia Rubber and Kamptulicon Co. Ltd., British Geon Ltd., British Recovered Rubber and Chemical Co. Ltd., Dunlop Rubber Co. Ltd., Durham Raw Materials Ltd., Ferguson Shiers Ltd., P. Frankenstein and Sons Ltd., Futura Rubber Co. Ltd., Goodyear Tyre and Rubber Co. (Gt. Britain) Ltd., Greengate and Irwell Rubber Co. Ltd., Honeywell Footwear Ltd., Hubron Rubber Chemicals Ltd., Lafotex Ltd., Latafoam Ltd., Lindsay and Williams Ltd., Monsanto Chemicals Ltd., New Consolidated Mines of Cornwall Ltd., Newcol Ltd., Phillips Rubbers (Manufacturing) Ltd., Precision Rubber Products Ltd., Rotunda Ltd., Rubber Heel Manufacturing Co., Rubber Latex Ltd., Rubber Regenerating Co. Ltd., Shell Chemicals Ltd., Sutcliffe Moulded Rubber Co. Ltd., F. Thompson and Co. Ltd., Vitafoam Ltd., Volcrepe Ltd., Witco Chemical Co. Ltd.

The Small World

Further details of the equipment of the balloon 'The Small World' (RUBBER JOURNAL AND INTERNATIONAL PLASTICS January 10, p. 42) have reached me. Among supplies carried in the balloon gondola were several items made by the Plastics Group of The Metal Box Company Ltd. They included Diothene polythene bags for storing food and for carrying a reserve water supply, and Poly-Tainer polythene bottles for storing the main stock of water. Gas was fed into the balloon through Diothene tubing. Incidentally, the value of Diothene, unaffected by moisture or extremes of temperature, has been proved on a number of Arctic expeditions over the last few years.

Metal Box had also played a part in the preliminary preparation of the flight. The canopy of the trial balloon, with which Mr 'Bushy' Eiloart (leader of the venture) gained his balloonist's licence, was made entirely of Diothene film.

Rubber Statistics

UNITED KINGDOM — MALAYA

DETAILS are now available of the United Kingdom rubber position up to the end of October. Consumption of natural rubber during October, which was a four-week period, amounted to 14,172 tons, the weekly average standing at 3,543 tons, compared with the September average of 3,352 tons. In October 1957 the weekly average had been 3,832 tons. The October total brought the consumption figure for the first 10 months of the year to 144,751 (148,852 tons). In the case of natural rubber latex, which is included in these totals, the October consumption amounted to 2,217 tons, bringing the total to the end of October to 20,953 tons.

Retained imports of synthetic rubber during October totalled 3,864 tons, bringing the total for the first 10 months of the year to 51,019 (45,728 tons); the 1958 total thus represents an increase of roughly 12%. Stocks of natural rubber on hand at the end of October amounted to 20,867 tons with manufacturers, and 16,881 tons in warehouses, making 37,748 tons in all, which represented a decline of just over 2,000 tons during the month. Stocks of synthetic rubber had also fallen by the end of October, from 11,950 tons to 10,859 tons.

Malayan Imports and Shipments

Malaya House has issued details of Malaya's ocean shipments and imports of rubber for the month of November. The following tables are expressed in long tons:

Ocean shipments to:	Sheet and crepe	Latex
UK	10,006	3,642
USA	12,551	2,435
Canada	2,461	—
Australia	1,685	193
Czechoslovakia	4,255	—
France	3,466	556
Western Germany	5,721	998
Italy	3,168	561
Netherlands	991	471
Poland	6,488	—
Spain	1,260	153
Sweden	1,692	56
USSR	16,455	—
Argentine	1,633	206
Japan	8,744	770
Others	8,517	617
	89,093	10,658

Imports from:	Total
Indonesia—Sumatra	18,154
Borneo	7,633
Others	6,366
British Borneo	3,034
Thailand	623
Others	156
	35,966

Ocean shipments during November brought the total for the first 11 months of 1958 to 985,064 (907,105 tons), representing an increase of about 10%. Shipments to the UK were up by nearly 2,000 tons compared with the October total, while shipments to the United States of America had fallen by about 600 tons. Shipments to the USSR were once again at a very high level, but did not reach the October figure of 18,933 tons. Shipments to Japan at 9,514 tons were more than 3,000 tons below the previous month's total. Once again there were no shipments to China.

Imports into Malaya during November were some 800 tons above the previous month's level and brought the year's total to 380,157 (338,403 tons), an increase of about 13%. Stocks of rubber in the Federation at the end of October totalled 75,627 tons, a decline of about 8,000 tons during the month. Of this total, 52,044 (56,994 tons) were in the hands of dealers, 17,861 (17,805 tons) were on estates, and 5,722 (9,090 tons) were held in the ports. Stocks of rubber in Singapore at the end of November totalled 46,657 tons, a decline of more than 7,000 tons since the beginning of the month. Dealers' stocks accounted for 33,776 tons of this total, and 12,849 tons were held in the port. In addition, a further 2,960 tons were on transhipment from ports outside Malaya.

New Minibrix Sets

Minibrix Ltd. have redesigned their children's constructional sets to conform with modern ideas on architecture and building. The new sets will appear in a cylindrical pack. These alterations, including changes in and additions to the colour range, have been made after extensive research and consultation with overseas buyers, particularly in Canada and the United States, and widespread tests among consumers and retailers.

US Rayon Yarn Prices Raised

E. I. du Pont de Nemours and Co. recently increased prices on its super cordura high-tenacity rayon yarns used for tyre cord and other industrial applications. Effective with March orders, prices on 1,650 deniers and over will be up two cents a lb. and 1,100 denier three cents. The advance follows similar action by other rayon producers on their tyre yarns.

Mr F. S. Physic has resigned as chairman and from the board of Bernam-Perak Rubber Plantations.

Patent Specifications

The following information is prepared from published Patent Specifications. The full Specifications can be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 3s. 6d. per copy (including postage).

Process for Bonding Articles

No. 803,054. Deutsche Gold-und Silber-Scheideanstalt vormals Roessler. Application and Filed, February 23 1956. Application in Germany, February 25 1955. Published, October 15 1958.

Metals, particularly light metals, are bonded together by means of adhesive compositions comprising essentially mixtures of (a) a liquid polymerizable vinyl compound with a terminal vinyl group, (b) neoprene, (c) another polymeric material, and (d) a catalyst for hardening the mixture, preferably a Redox catalyst. Other compounds which may be added to the compositions to improve the adhesion include acrylonitrile or methacrylonitrile and an ester of fumaric acid or maleic acid. It is also advantageous to add a casting resin. In the examples, styrene is used as the liquid polymerizable vinyl compound and polystyrene as the polymeric material additional to neoprene.

Composite Rubber Articles

No. 804,005. The Research Association of British Rubber Manufacturers. Inventor: S. P. Gundavda. Application, November 7 1955. Filed, November 1 1956. Published, November 5 1958.

Satisfactory adhesion of a mixture of latex and resorcinol-formaldehyde resin to 'Terylene' or other polyester filament is achieved by treating the 'Terylene' with a solution of sodium hydroxide for a short time. The 'Terylene' may be in the form of tyre cord or belting duck, and after treatment with the sodium hydroxide the material is washed, passed through a mixture of latex and resorcinol-formaldehyde resin and then dried. An unvulcanized rubber compound is applied to the treated cord or fabric and vulcanized to form a composite article of rubber bonded to 'Terylene.'

Shorter Abstracts

Polyurethane Foam. 801,070. The B. F. Goodrich Co. Filed, September 20 1956. — Finely divided mica is incorporated into the reaction mixture of polyester, polyisocyanate and water for producing polyurethane foam. A preferred range of proportions of mica is about 15 to 30 parts per 100 parts of polyester.

Electrical Insulating Materials. 800,815. Farbenfabriken Bayer AG. Filed, June 8 1955.—The use of aromatic polycarbonates of high molecular weight as electrical insulating materials is claimed. The polycarbonates may be made by reacting aromatic dihydroxy compounds with diesters of carbonic acid or with phosgene.

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Rubber and Plastics Stock Market

A REVIEW OF PRICES AND TRENDS

THE trend in stock markets is still upwards, the general undertone remains one of the upmost confidence in the future. Buying of top grade industrial shares is continuing on an impressive scale although it is now more selective than it has been for the past month or so.

The plastics section of the market, encouraged by several cheering company news items, has shared in the upward adjustment and there has been considerable buying of both shares in this category, and of the rubber manufacturing industry.

The price movements in our accompanying table show that for the first time in many weeks there are very few new 'peak' prices to record. Even where new highs have been reached it is in shares which do not fit into the market's description of 'blue chips,' this is a clear reversal of the pattern of other weeks when most of the top points have been scored by the leading shares. It is probably a reflection of a perceptible change in the direction of investment monies. Instead of the bulk of new money coming into the market being syphoned off by the leaders, much of it is now finding a home in shares not of the 'blue chip' class. Several brokers in recent weeks have emphasized the attractions of the lower order of industrials which in the main have missed out on the big rise. These circulars have at times contained references to plastics and rubber manufacturing companies.

DUNLOP RUBBER ordinary shares have been one of the favourites and fairly good class investment buying has left the price around 1s. higher at 24s. 6d., but still a fair way from the peak of the 1958/9 period of 26s. 7½d. If the market is right in its present attitude, however, it will not be surprising to see a new high level touched in the course of the next few weeks.

After their recent shake-out the shares of the BRITISH XYLONITE concern staged a further rally to 47s. 6d. while the ordinary of DE LA RUE equalled the previous peak of 32s. 6d.

FRANCIS SHAW ordinary were up to a new high of 15s. 7½d. and BAKER PERKINS ordinary also gained that distinction with a rise of 1s. 10½d. to 45s.

The news from the BRITISH INDUSTRIAL PLASTICS group of a maintained final dividend of 12½% was expected by the market. This rate was forecast at the time of the 'rights' issue last September. The results, however, were slightly better than expected, and following the news the ordinary shares became active and higher. The price rose to 7s. 6d. which is only pennies beneath the previous best.

Group profit, before taxation and depreciation came out at £979,000, a rise of some £73,000. The charge for depreciation is up by £52,000 at £280,000, while taxation takes around £386,000 against £371,000, leaving a net profit of £312,000 compared with £296,000. The allocation to general reserves is left unchanged at £150,000

Continued on page 100

Share Price Movements

Par Value	Company	1958-59 High	Low	Jan. 5	Latest
5/-	Albright & W. Ord. ..	21/3	13/4½	20/9	21/-
£1	„ „ „ 5% Pref...	16/7½	15/4½	16/6	16/-
5/-	Anchor Chemical Ord...	11/6	10/3	10/9	10/9
5/-	Andersons Rub. Ord. ..	4/-	3/-	3/1½	3/1½
2/-	Anglo-Amer. Vulc. Fibre Ord.	3/3¾	2/-	3/1½	3/1½
£1	Angus Geo. Ord. ..	29/10½	21/-	28/9	29/9
5/-	Armitage (Sir Elk.) Ord.	3/9¾	2/3	3/3	3/-
5/-	Ault & Wiborg Ord. ..	24/3	13/9	23/-	24/3
£1	Avon India Rubber Ord.	42/-	27/-	36/3	36/3
£1	„ „ „ 6% Pref.	18/6	17/3	17/6	17/6
10/-	Bakelite Ord.	23/3	17/-	20/9	22/3
£1	„ 6% Pref. ..	19/6	18/3	18/3	18/3
£1	Baker Perkins Ord. ..	45/7½	30/7½	43/9	45/-
4/-	Bank Bdg. Rubber Ord.	2/7½	1/6	2/-	2/-
5/-	Boake (A.) Roberts Ord.	18/6	9/-	11/-	13/-
£1	„ „ „ 5% Pref.	15/1½	13/9	13/9	13/9
4/-	Brammer H. Ord. ..	14/1½	9/-	14/-	14/-
5/-	Bridge, David Ord. ..	25/3	16/3	23/-	23/6
5/-	Bright, John Ord. ..	13/10½	8/9	8/9	9/6
2/-	Brit. Ind. Plas. Ord. ..	7/7½	4/9	6/9	7/6
2/-	„ 10% (tax free) Pref.	5/9	4/8¼	4/9	4/9
£1	British Xylonite Ord. ..	50/6	28/6	46/3	47/6
£1	„ „ 5% Pref.	15/6	14/-	14/9	14/9
5/-	BTR Ind. Ord.	13/3	9/4½	12/6	11/-
£1	„ „ 7½% Pref. ..	22/6	20/9	22/6	22/6
£1	Courtaulds Ord... ..	33/6	20/-	32/9	33/6
£1	„ 5% 1st Pref.	18/6¾	15/7½	16/3*	16/3
£1	„ 6% 2nd Pref.	19/6	17/1½	19/6	19/6
4/-	Cow, P. B. Ord... ..	6/0¾	3/6	5/6	5/9
£1	„ 5% Pref. ..	13/6	10/9	12/6	12/6
5/-	Dale, John Ord... ..	15/-	10/-	11/-	11/-
£1	„ „ 6% Pref. ..	15/6	13/-	15/-	15/6
1/-	Dann'mac Mfg. Ord. ..	5/6	2/6	4/10½	5/4½
10/-	De La Rue Ord. ..	32/6	20/9	32/-	32/6
£1	„ „ „ 3½% Pref.	11/9	10/-	11/-	11/-
6/8	Distillers Co. Ord. ..	27/-	15/9	25/6†	25/6†
£1	„ „ 6% Pref...	20/10½	19/10½	20/-	20/-
£100	„ 5% Conv. Loan	£96½	£91	£93½	£93½
£100	„ 5½% Unsec. Loan	£93½	£87 7/16	£93½	£93
10/-	Dunlop Rubber Ord. ..	26/7½	14/9	23/6	24/6
£1	„ 5½% Pref.	18/9	15/10	17/9	17/9
£100	„ 3½% 1st Debs.	£73	£67¾	£72½*	£72½
£100	„ 4½% 2nd Debs.	£81	£78	£79½	£79½
4/-	Ebonite Cont. Ord. ..	13/3	7/6	13/3	13/3*

Par Value	Company	1958-59 High	Low	Jan. 3	Latest
£1	English China Clays Ord.	47/9	29/9	45/-	47/6
£1	Goodyear Tyre 4% Pref.	12/9	12/-	12/4½	12/6
5/-	Greeff Chem. Ord. ..	17/9	14/-	16/-	15/9
10/-	„ „ 5½% Pref.	8/-	7/9	8/-	8/-
4/-	Greengate & Irwell Ord.	7/0¾	4/9	5/-	5/3
1/-	Hunt & Moscrop Ord...	1/5	1/1½	—	1/3
£1	Imp. Chem. Ord. ..	37/3	28/3	37/3	35/9
£1	„ „ 5% Pref. ..	17/3	16/-	16/6*	16/6
£100	„ 4½% Unsec. Loan	£87	£80	£86	£87
£100	„ 5½% Conv. Loan	£121	£99	£119½*	£117½
1/-	Kleemann (O. & M.) Ord.	5/5½	2/6	4/4½	4/6
£1	„ „ 6½% Pref.	16/3	15/-	16/-*	15/6
2/-	Lacrinoid Prod. Ord. ..	2/-	1/5¾	1/6	1/6
5/-	Laporte Ind. Ord. ..	19/10½	13/7½	19/9	19/9
£1	„ „ 7½% Pref.	22/10½	21/10½	22/3	22/3
£1	Leyland & Birm. Rubber Ord.	72/-	41/-	68/9	71/3
£1	„ „ 6% Pref.	21/3	16/1½	16/10½	16/10½
2/-	London Rubber.. ..	13/1½	8/6¾	12/6	13/-
£1	„ 6% Red. Cum. Pref.	19/9	16/3	18/9*	18/9
£1	McKechnie Bros. Ord.	45/-	32/6	—	45/-
£1	„ „ 'A' Ord.	44/6	30/-	—	44/6
£1	„ „ 6% Cum. Pref.	—	—	—	16/3
5/-	Monsanto Chem. Ord. ..	16/4½	13/-	16/-	15/9
£1	„ „ 3¾% Pref.	12/6	11/-	12/-	12/-
£100	„ „ 6% Debs.	£104	£101¼	£102*	£103
£1	North British Rubber ..	—	—	15/3	15/3
2/-	RFD Ltd. Ord... ..	5/0¾	3/5½	4/1½	4/4½
£1	„ „ 5½% Pref. ..	14/6	11/6	12/6*	13/9
2/-	Rubber Imp. Ord. ..	15/-	6/-	6/-	7/-
2/-	„ „ 'A' Ord.	15/-	6/-	6/-	7/-
£1	„ „ 5% 1st Pref.	12/3	10/-	11/3	10/-
5/-	Rubber Reg. Ord. ..	—	—	10/3†	11/6†
4/-	Shaw Francis Ord. ..	15/7½	9/9	12/9	15/7½
2/-	Sussex Rubber Ord. ..	1/8	7½	1/7½	1/7½
5/-	Sutcliffe Speak. Ord. ..	7/4½	5/-	6/9	6/3
£1	Turner & Newall Ord...	73/9	52/-	73/9*	73/1½
£1	„ „ 7% Pref.	24/-	22/1½	23/9	23/3
5/-	Universal Asbestos Ord.	14/4½	8/0¾	14/4½	14/10½
5/-	Viscose Dev. Ord. ..	9/6	6/3	8/9	9/4½
5/-	Warne William (Holdgs.) Ord.	11/10½	8/-	11/6	11/6

* Ex-dividend † Ex-cap.

Rubber Markets

LONDON

A generally firm tendency has been maintained in the London rubber market during the past week and prices are again slightly higher compared with previous levels. The gains amount to about ¼d. per lb. with the Spot this amount up at 25⅝d. per lb. The further improvement reflected higher Eastern advices, the rise in the East being attributed to Russian buying. There was also a certain amount of covering in progress while more interest by US buyers was reported.

Latest prices are as follows:

No. 1 RSS Spot: 25d.-25⅛d.

Settlement House:

February 25d.-25⅛d.

March 25⅛d.-25½d.

April/June 25½d.-25⅝d.

July/September 25⅝d.-25⅞d.

October/December 25¾d.-26d.

No. 1 RSS cif basis ports:

January 24⅞d.-25⅛d.

February 25d.-25⅛d.

Godown:

February 85¾ Straits cents nominal.

LATEX

Centrifuged latex per gallon in drums, January/February shipment, 14s. 6d. seller, cif European ports. Spot, seller, 15s. 1d. Bulk, seller, 15s. Creamed, seller, 14s. 1d. Normal, seller, 11s. 4d.

SINGAPORE

The market opened around previous closing levels on January 12 and ruled quiet with narrow fluctuations. Apart from some covering for Russian shipment, lower grades were neglected. Factories showed little interest. In the afternoon the market continued quiet with prices tending to ease on lack of demand. Lower grades were neglected. After-hours, the market was slightly easier.

Straits cents per lb. fob Malayan ports to open ports

	Close	Previous Close
No. 1 RSS, Jan.	86⅛—86⅜	86⅝—86⅞
Feb.	86⅜—86⅝	86⅞—87⅛
No. 2 RSS, Jan.	84⅛—85	84⅜—85⅛
No. 3 RSS, Jan.	83⅛—84	83⅜—84⅛
No. 4 RSS, Jan.	82⅛—82⅜	82⅛—83
No. 5 RSS, Jan.	79⅜—80⅛	79⅜—80⅛
No. 1 Spot	85⅞—86⅛	86⅛—86⅜
No. 3 blanket, thick remilled, Jan.	78 —80	78 —80
No. 1 fine pale crepe, Jan.	89 —91	89½—91½

Tendency: Slightly easier

Latex, native produce, 60% centrifugal, packed in rec. drums fob 168.00d. per gallon.

NEW YORK

The following landed prices ruled in New York on January 12:

DEALERS' PRICES

	Jan. 12	Previous
	Cents per lb.	
No. 1 RSS, Jan.	30¼a	30½a
Feb.	30¼a	30⅜a
No. 2 RSS, Jan.	29⅜a	30 a
Feb.	29⅜a	29⅞a
No. 3 RSS, Jan.	29¼a	29⅜a
Feb.	29¼a	29¼a
No. 1 RSS, Spot	30¼a	30½n
No. 3 amber blanket crepe, Feb.	27¼a	27¼a
No. 1 latex, thin crepe, Jan.	30¼n	30½n
No. 1 latex, thick crepe, Jan.	29⅞n	29⅞n

FUTURES—REX CONTRACT

	Close	Prev. Close
Jan.	30.40b–30.45a	30.55b–30.75a
March	30.25t	30.45b–30.50a
May	30.10b–30.15a	30.25t
July	30.02 –30.00t	30.15b–30.25a
Sept.	30.00t	30.15t
Nov.	29.90b–30.00a	30.05b–30.15a
Jan.	29.80b–29.90a	*29.95b–30.05a

Sales: 29. Tendency: Dull. *Corrected*

Rubber futures were about steady in meagre volume on January 12. Traders said the market was featureless, with shipment offerings moderate, and dealer and factory buying interest limited to light quantities.

AMSTERDAM

The Amsterdam rubber market ruled as under on January 12:

No. 1 RMA	Jan. 12	Previous
	Guilders per kilo	
January	2.45	2.45
February	2.45	2.45
March	2.45	2.45
Jan./March	2.45	2.45
April	2.48	2.48
May	2.49	2.49
June	2.49	2.49
April/June	2.47	2.45
July	2.50	2.50

Sales: 60. Tendency: Quiet

DJAKARTA

There was fair interest in rubber for ready and nearby delivery on January 12. The close was quietly steady. Export certificates were quoted at 332 paid-buyer.

	Jan. 12	Previous
	Rupiahs per kilo	
Spot No. 1 Priok	23.50b	23.25b
Spot No. 2 Priok	22.25b	22.10b
Spot No. 3 Priok	21.10b	21.10b
No. 1 fine pale crepe	22.50b	22.25b

Tendency: Steady

BANGKOK

No. 1 RSS

The price for No. 1 RSS, at Bangkok on January 12 was 27.25 (27.25) US cents per lb.

CEYLON

No. 1 RSS

The price for No. 1 RSS, spot, at Colombo on January 12 was 107 (107) Ceylon cents per lb.

SYNTHETIC RUBBER PRICES

While the prices quoted for Plioflex (Goodyear) synthetic rubber in *RJIP* January 3 issue were correct in pence per lb., the heading should have read 'fas US port' and not 'cif UK dp.' Prices, in US cents per lb., are as follows:

1006	Hot, Non-Pigmented ...	23.25
1500	Cold, Non-Pigmented ...	23.25
1502	" " ...	23.25
1703	Cold, Oil-Extended	20.00
1710	" "	18.25
1712	" "	18.25
1713	" "	16.9
1714	" "	16.65
1773	Cold, Oil-Extended, Light-Coloured	20.00
1778	Cold, Oil-Extended, Light-Coloured	18.5

STOCK MARKET

Continued from page 99

and the carry forward is increased by £6,000 at £273,000.

BRITISH GLUES AND CHEMICALS is maintaining its half-time payment on the ordinary shares 5%. Last year this was followed by a final distribution which lifted the total to 20%. There had been rumours around the market of a higher payment.

One of the best gains in the past two or three weeks of stock market activity has been scored by the ordinary of the LEYLAND AND BIRMINGHAM RUBBER group. These shares were lifted 2s. 6d. to 71s. 3d. according to our table which spans two weeks but in the intervening period have been as low as 66s.

This rise came after the company had announced details of a scrip issue which will be made to shareholders on a two-for-three basis. This is really a model share bonus. It does not in any way reduce the actual revenue reserves of the parent company. In fact it stems from a revaluation of properties in a subsidiary company, which, allowing for the fact that £800,000 has to be capitalized is in itself a 'bullish' factor.

The market hopefuls are, of course, expecting a higher payment as a result of this share bonus. Last time the total distribution was 25%. The directors do not issue any statement regarding dividend policy but a maintenance of last year's rate would still leave the price of the shares well justified on yield considerations alone.

From BRITISH RAYOPHANE comes an interim dividend of 10% which is double the payment of a year ago. Dunlop Rubber announced that the offer to the Slazengers group had been accepted by more than 90% of the total shares.

Esso Butyl makes a splash!

WHY IT'S BETTER

Esso Butyl rubber insulation can better withstand higher temperatures but is also unaffected by low temperatures. It has outstanding resistance to cracking, weathering, corona discharge, oxidation, ageing, and the adverse effects of humidity. Because of their good heat resistance, cables covered with Esso Butyl rubber can also be used in boiler and engine rooms.

WHY IT'S CHEAPER

Esso Butyl rubber covered cables can operate at higher temperatures and, therefore, permit higher current ratings than ordinary rubber covered cables. So for a given current rating a lighter, and therefore cheaper, Esso Butyl rubber covered cable can safely be specified. Other savings are that Esso Butyl rubber covered cables need no special sealing at joints to keep out moisture, and have a much greater service life—making them far cheaper in the long run.

APPROVED BY LLOYD'S

Cables insulated with Esso Butyl rubber are approved by Lloyd's Register of Shipping. They are available from most cable makers. Make sure you are using today's outstanding ship wiring insulation—mechanically, electrically and economically—by specifying Esso Butyl to your usual supplier.

Esso Butyl is identical to 'Enjay' Butyl which has established a high reputation in the United States

Industry INTELLIGENCE

Technical Data

Polymon Blue LBS

Polymon Blue LBS is a phthalocyanine pigment, specially designed and controlled for the mass-colouring of plastics, to give bright, mid-blue shades of very high light fastness. It is much stronger than Polymon Blue BS. Results of tests of the heat stability and light fastness performance of Polymon Blue LBS in cellulose acetate, polythene and polystyrene are given in leaflet SC817, issued by Imperial Chemical Industries Ltd. The main advantage in heat stability of this pigment is found in its use in these three plastics, but it is suitable also for mass-colouring other plastics, including phenol-formaldehyde, urea-formaldehyde, melamine-formaldehyde, cellulose nitrate, acrylics, nylon and casein.

Toughened Polystyrene Moulding Powder

Lustrex T-7 is a toughened polystyrene moulding powder which has been specially formulated to conform to the physical property requirements of Type 2 toughened polystyrenes of the draft new BS for toughened polystyrene moulding materials. Data for the physical properties of Lustrex T-7 are given in Technical Service Bulletin No. P24/1, issued by Monsanto Chemicals Ltd. (Plastics Division), Monsanto House, 10-18 Victoria Street, London, S.W.1.

The physical properties of General Purpose Lustrex and Lustrex T-3 are included for comparison, Lustrex T-7 being intermediate in properties between the two other types. Lustrex T-7 possesses a toughness which is adequate for all but specialist purposes and has excellent surface gloss. It is readily mouldable on standard injection moulding machines by much the same techniques as are used for other polystyrenes.

Sodium Aluminate for Curing Nitrile Rubber Latex

Nitrile rubber films possessing excellent clarity and good physical properties can be obtained from Hycar latex 1,571 by using sodium aluminate as the curing agent. Comparative data for the physical properties of nitrile rubber films cured with sodium aluminate and with conventional curing agents are given in Information Sheet No. H.106, issued by British Geon Ltd., Devonshire House, Piccadilly, London, W.1.

Sodium aluminate is a relatively cheap material and is easy to incorporate in Hycar latex 1,571. The nitrile rubber films obtained are equivalent in heat and light ageing characteristics to films cured with zinc oxide. Hycar latex 1,571 has a high acrylonitrile content and is recommended for use in leather finishes, paper sizing and finishing, and for other applications where tough, abrasion-resistant coatings are required.

Blends of Nitrile Rubber with PVC for Cable Sheathing

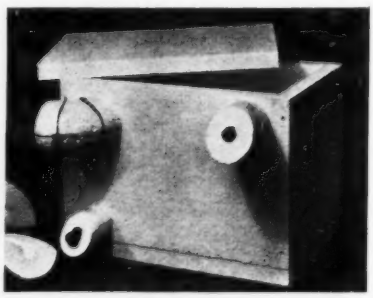
Blends of Polysar Krynac 803, a 'cold' nitrile rubber, with (a) PVC and (b) a vinyl chloride-vinyl acetate copolymer, have been evaluated for their suitability for cable sheathing. Preliminary results are presented in Polysar Technical Report No. 7 : 9A, by L. A. Bustos, distributed in the UK by Polymer (UK) Ltd., Walbrook House, Walbrook, London, E.C.4.

One compound contained 200 phr of PVC while three other compounds contained 100, 150 and 200 phr of a vinyl chloride-vinyl acetate copolymer. A butyl rubber stock, designed for a good quality sheathing, was included for comparison. The mixing procedure is described and data are given for the physical properties of the unaged vulcanizates and for the changes in these properties after heat ageing in air and in oil. Results of an ozone test are included. In addition to their good extrusion characteristics, the blends have excellent physical properties, fast cure rates and outstanding processing safety.

Machines, Materials and Equipment

Expanded Polystyrene Tank Lagging

Cut pieces of expanded polystyrene to fit cold water tanks of all sizes, are being produced by the Marley Tile Co.



Ltd., Sevenoaks, Kent. These 'Marleycel Tank Lagging Sets' are being made from 1½in. thick sheets, and will, the manufacturers claim, provide effective protection for cisterns situated in the normally 'bleak' loft areas. Each set comprises five boards to fit the sides, ends and top; allowance is made to cope with any normal irregularity in the tank dimensions. Fixing the sheets round the tank is quickly and easily done with wooden pins (supplied with the set) which are skewered in.

In addition to the tank sets, lengths of Marleycel pipe lagging are also being made available. These are in half sections, 3ft. long which, placed round the pipe, are held in position with adhesive tape.

Silvering Preparation

A new thermo-setting silvering preparation that has been given the code name FSP 35, has been developed by Johnson Matthey and Co. Ltd., London. This preparation is based on silver in the form of finely divided flake and is specifically designed to enable surface films of relatively high conductivity to be applied by spraying or brushing to such materials as plastics, ceramics, graphite and glass. The only limitation on its application to these surfaces is that the material being coated must withstand heating to 80°C., the minimum temperature necessary for curing the organic vehicle that carries the silver. The preparation has excellent covering power and the stoved film is hard and abrasion-resistant, with an electrical resistance in the range of 0.2 to 2 ohms per square. Furthermore the film will withstand water and is not affected by many of the organic solvents in general use. Additional information on FSP 35 is available on application to the company's head office at 73-83 Hatton Garden, London, E.C.1.

Ready-mix Pre-polymer for Polyurethane

Daltocel PP1, a pre-polymer obtained by reacting a polyether with an organic di-isocyanate is suitable for use in the manufacture of flexible polyurethane foams. It is a valuable addition to the range of primary raw materials available and means that manufacturers will no longer need to handle or mix the separate reactants.

100 parts of Daltocel PP1 should be mixed with 4.6 parts of an activator consisting of a catalyst mixed with an emulsifier and water. Reaction and expansion to produce a high-quality foam of fine pore structure take place within 20 minutes, after which processing is completed by curing for 2-4 hours at 120°C. in air.

Daltocel PP1, claimed to be stable for at least three months at 45°C. if stored under dry conditions, is a pale yellow viscous liquid, neutral in reaction, but containing some free tolylene di-isocyanate which necessitates appropriate precautions in handling. It is said to be entirely suitable for use for foam production in continuous processing machinery. The recommended catalyst and emulsifier are Catalyst SFC and Lubrol SF2.

FRENCH CHALKS

THREE STANDARD TYPES AVAILABLE

- A FINE PURE WHITE FOR COMPOUNDING
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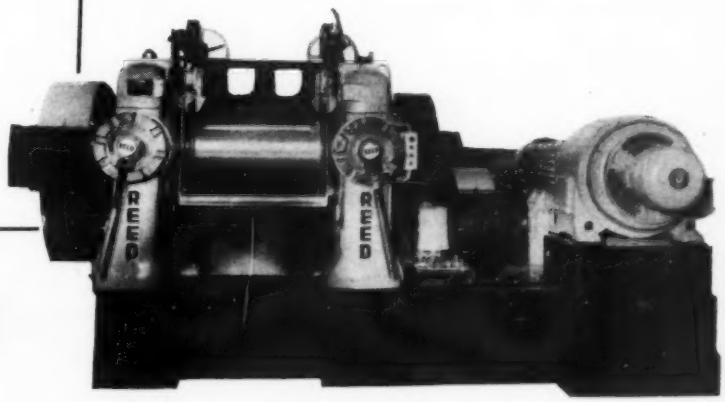

REED REFINING MILL

Illustrates the **SECOND** REFINER MILL supplied to :—
The Cannon Rubber Manufacturers Ltd., of Tottenham.

30" x 24" and 19" **DOUBLE GEARED HEAVY DUTY REFINING MILL,** water cooled rear bearings, pressure lubrication, machine cut gears, steel bushes, with punch-type breaker discs. Anti-vibration mounted bedplate with 100 h.p. drive and plug braking.

For further details :

REED BROTHERS
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REPLANT WORKS, WOOLWICH INDUSTRIAL ESTATE, LONDON, S.E.18.
Telephone : Woolwich 7611/6 *Telegrams : REPLANT, LONDON, S.E.18.*

D1

Future Events

INSTITUTION OF THE RUBBER INDUSTRY

Council meeting on January 27 at 4 Kensington Palace Gardens, London, W.8, at 2.15 p.m.

Manchester Section. — Monday January 26 at the Grand Hotel, Manchester, at 6.45 p.m. 'Effects of Irradiation on Polymers and Protective Clothing,' by A. Quinton, M.Sc., F.Inst.P., A.K.C., United Kingdom Atomic Energy Authority. Joint meeting with the Plastics Institute.

PLASTICS INSTITUTE

London and District Section.—Tuesday January 20 at the Wellcome Building, 183-193 Euston Road, London, N.W.1, at 6.30 p.m. 'Fluorine Containing Polymers,' by Professor M. G. Stacey, F.R.S., University of Birmingham.

North-Eastern Section.—Wednesday January 21 at the Second Dining Room of the Eldon Grill, Grey Street, Newcastle, at 7 p.m. 'Melamine Resins and their Applications,' by F. P. Grimshaw, A.P.I., British Oxygen Co. Ltd.

North-Western Section. — Monday January 26 at the Grand Hotel, Manchester, at 6.45 p.m. 'The Effects of Irradiation on Polymers and Protective Clothing,' by A. Quinton, M.Sc., F.Inst.P., A.K.C., United Kingdom Atomic Energy Authority. Joint meeting with the Manchester Section of the Institution of the Rubber Industry.

Tenders Wanted

Vulcanizing Machines, Ceylon

The Chairman, Tender Board, Ceylon Transport Board, Kirula Road, Narahenpita, Colombo, quotation No. 10/36721, has issued the following requirements: 31 tube vulcanizing machines operated from 230 volts, single phase, 50 cycles AC supply. Vulcanizing area, 6in. by 6in., should be thermostatically controlled and fully automatic. Should include valve reseater for reseating all types of valves, all tools and initial supply of vulcanizing material.

The closing date is February 25 1959.

A limited number of tender documents is available from the Export Services Branch, Board of Trade, Lacon House, Theobalds Road, London, W.C.1 (Telephone: CHAncery 4411 Extn. 738 or 771), for issue to UK firms in order of receipt of applications, and reference number ESB/757/59 should be quoted in all correspondence to the Export Services Branch in this connexion.

Durham Raw Materials Ltd., 1-4 Great Tower Street, London, E.C.3, announce that they have been appointed sole selling agents in UK for the full range of filter presses manufactured by F. H. Schule Ltd., Hamburg 26.

TRADE MARKS

Objections to the registration of any of the undermentioned applications may be lodged with the Comptroller-General of Patents, Designs and Trade Marks at the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, within one month of the date mentioned. The objections must be stated on Trade Marks Form No. 7, cost £2, obtainable through any money order office. The extracts—from "The Trade Marks Journal"—given below are reproduced by permission of the Controller of H.M. Stationery Office.

THORN PLASTECK (759,095) For lighting fittings and lighting apparatus and appliances, all made of plastics; and electric lamps. By Thorn Electrical Industries Ltd., 105 to 109 Judd Street, London, W.C.1. To be associated with No. 652,367 and others. (Class 11; December 10 1958.)

PERMATRED (780,806) For all goods included in Class 17. By Permali Ltd., 125 Bristol Road, Gloucester. To be associated with No. 711,903 and others. (Class 12; December 10 1958.)

NICLOCK (B775,849) For sealing caps made principally of cork or of plastics for containers. By Le Bouchon Rapid, 'Les Darcins,' Cusset, Allièr, France. Address for service is c/o Eric Potter and Clarkson, 317 High Holborn, London, W.C.1. (Class 20; December 10 1958.)

SWIMMER JOINS DUNLOP

Miss Rowena Ker, the well-known underwater swimming expert and former debutante, has come to an arrangement with the Dunlop Sports Co. Ltd. whereby she will promote sales of their underwater swimming equipment. In her new capacity she will tour the country lecturing and giving practical demonstrations. Miss Ker, who is 25, is a member both of the British Sub-Aqua Club and the Jersey Sub-Aqua Club. Miss Ker was featured in the Dunlop film 'Horizon Below'

PATENT LIST

Printed copies of the Specifications in the following list can be obtained from the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d., including postage, but about six weeks after the date of this publication will usually elapse before they come available. Orders with remittance may be sent in advance to the Patent Office, and will be fulfilled immediately the Specifications are published.

COMPLETE SPECIFICATIONS ACCEPTED

Open to public inspection on January 21 1959

Walker Extract and Chemical Co. Ltd. Manufacture of phenolic resins. 807,851.

B. F. Goodrich Co. Reinforcing fillers for rubbery materials and rubbery compositions containing same. 807,911.

Dunlop Rubber Co. Ltd. Moulding or remoulding pneumatic tyres. 807,821.

J. B. Millar. Method of producing tube bends of reinforced thermosetting plastic material. 807,861.

G. Shaw. Production of filaments of synthetic polymers. 807,804.

Monsanto Chemical Co. Thermoplastic moulding powders. 807,686.

Firestone Tire and Rubber Co. Foam latex slab-making apparatus. 807,740.

Union Carbide Corporation, formerly Union Carbide and Carbon Corporation. Polyurethanes. 807,808.

Union Carbide Corporation, formerly Union Carbide and Carbon Corporation. Extrudable polythene compositions. 807,664.

De Bataafsche Petroleum Maatschappij N.V. Process for the preparation of polyvinyl chloride. 807,634.

NEW COMPANIES

ADH (Manchester) Ltd. (616,342).—December 9. Capital: £100 in £1 shares. To carry on the business of manufacturers of and dealers in cotton, wool, rayon, silk, flax and linen, jute, hemp, rubber, plastic or any filamentous or fibrous material, etc. The subscribers (each with one share) are: Cedric H. W. Taylor, Whiteholme, Clayton-le-Dale, near Blackburn; Charles Mayoh, Springfield House, Heath Charnock, near Chorley. The first directors are not named. Solicitors: John Taylor and Co., 9 Lower Mosley Street, Manchester, 2.

PJT (Manchester) Ltd. (616,355).—December 9. Capital: £100 in £1 shares. Other particulars are similar to those of ADH (Manchester) Ltd.

PMDT (Manchester) Ltd. (616,356).—December 9. Capital: £100 in £1 shares. Other particulars are similar to those of ADH (Manchester) Ltd.

Mr Peter A. Revell-Smith has been elected to the board of the Rubber and Industrial Trust and appointed managing director.